A HISTORY OF THE CANADA INSTITUTE FOR

SCIENTIFIC AND TECHNICAL INFORMATION (CISTI)

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1. INTRODUCTION

CISTI has emerged in the past decade as a force in the international STI community. The organization has a long and respected history within Canada, both as the national library for science, technology and medicine, and as the country's largest scholarly publisher.

Founded in the early part of the twentieth century, the library of the National Research Council of Canada evolved into the National Science Library (NSL) and then to the internationally-known Canada Institute for Scientific and Technical Information. From 1962, when it produced its first index using punched cards, CISTI has been an early adopter of new technologies that support the creation and delivery of information services to its clients. CISTI's Document Delivery service, supported by the IntelliDoc system, delivers close to 700,000 documents per year to clients around the world. At the same time, CISTI continues to respect its roots, by exploring new and creative ways to serve the researchers of the National Research Council and the innovation community in Canada.

In parallel, the NRC Research Press published the first issue of the Canadian Journal of Research in May 1929. By 1994, when it merged with CISTI, it was publishing 14 peer-reviewed research journals. It currently publishes 15 NRC journals, provides publishing services for 15 affiliated society journals, and has published more than 70 monographs. The journals are made available without charge to Canadians as part of the Depository Services Program, and a new Pay-per-View service allows non-subscribers to purchase copies of individual articles on demand.

CISTI builds and maintains active relationships with its national and international stakeholders – including publishers, journal editors, academic consortia, and NRC researchers – in order to be able to guarantee Canadians access to the world's scientific, technical and medical literature, and is vigorously pursuing projects that will ensure this access in the new electronic world.

CISTI's primary mission is to Canadian researchers, innovators and entrepreneurs. However, to maximize the resources that CISTI can dedicate to Canadian innovation, CISTI leverages its human, financial and knowledge resources by providing service to the international community. In fact, CISTI is unique among members of the Canadian Association for Research Libraries (CARL) in the breadth of its clientele – covering industrial, academic and government clients in Canada, the United States and overseas.

2. FOUNDING AND HISTORY OF CISTI

In the first edition of this Encyclopedia, Jack E. Brown (1) described the early history of CISTI and provided a brief outline of CISTI's evolution between 1924 and the early 1970s and that will not be repeated here. For more background on the early history of NRC itself consult Mel Thistle's detailed account in "The Inner Ring" (2). For more detail on the political and legal environment of CISTI's early days, consult the NRC Publication by Brian Steeves (3). H.J. Abraham Goodman, in his lengthy article on the planning of national library services, devotes a significant part to the Canadian scene, in particular discussing CISTI's role with respect to the National Library of Canada (4). Ching-chih Chen in her survey of scientific and technical libraries worldwide, provides an outline of the services provided by CISTI in 1979 (5).

Information Services To NRC And Canadian Researchers

The cornerstone of CISTI from its earliest days has been the provision of information services to NRC and Canadian researchers. Services to NRC researchers were provided, for the most part, from branch libraries located in the research divisions. Initially, there were eight located in Ottawa (six serving the Divisions of Aeronautical Engineering, Electrical Engineering, Chemistry, Physics, Building Research, and the Administration offices, and two serving laboratories located at Uplands Airport and the original NRC building on Sussex Avenue), two regional branches in Halifax and Saskatoon, and small collections supporting astronomical observatories in Victoria and Penticton. Some were

funded directly by their divisions, and most functioned more or less autonomously. As the National Research Council grew, many of the new research institutes were located in regions outside of Ottawa, and NRC looked to CISTI to provide information services to these regional institutes. Gradually, all but one of the original branches came under the CISTI umbrella and nineteen CISTI sites exist as of 2005.

Information services to Canadian researchers in academic institutions, industry and other government organizations were provided centrally, from the main library in Ottawa. Services included quick reference, literature search and referral. Between the early 1970s and 1995, specialized services to Canada's medical community were offered by the Health Sciences Resource Centre (HSRC). The HSRC was responsible for coordinating access to MEDLARS and DOCLINE, automated systems of the US National Library of Medicine for information retrieval and document ordering respectively. This coordination role included the provision of training and client support to Canadian subscribers.

Technology And Information Delivery

The year 1962 marked the start of mechanization of library operations using IBM punch cards. This technology was exploited in 1963 to produce the National Science Library (NSL)'s first database, a list and index of NRC publications, and then in 1965 to produce the first electronic edition of the *Union List of Scientific Serials in Canadian Libraries*.

CAN/SDI (Canadian Selective Dissemination of Information) was a current awareness service developed by NSL and launched in 1968. It was an enormously successful and influential service that was used as a model by national information services and commercial information suppliers around the world, and that put NSL on the international map. The software was provided to UNESCO in 1971 for free distribution to interested countries. The service was based on automated matching of carefully constructed client profiles against tapes of newly published material from commercial databases.

In 1972, the cumulated database tapes with a common search engine and command language were released as CAN/OLE (Canadian On-Line Enquiry), the first real-time information search and retrieval system in Canada. CAN/OLE offered access to some of the large, internationally-recognized indexes to scientific literature, such as Chemical Abstracts, BIOSIS and Engineering Index, as well as to smaller Canadian sci-tech databases such as Aquaref, Alberta Oil Sands Index, and Boreal, and databases of library catalogues and directories.

Meanwhile, the delivery of documents from the growing collection was evolving into a national service. In 1964, telex was adopted to improve ordering services, and in 1969, the delivery of documents accelerated with the installation of the first fax machines. Document ordering from CAN/OLE was introduced in 1977 under the name CAN/DOC. Gradually, routines were developed under the CAN/DOC banner for the conversion of all orders to a common format, for the linking of orders to the client tables, for the

automated call numbering of orders against the CISTI catalogue, and for the linking of orders to copyright tables. The final result was a fully automated process for managing incoming orders.

In 1994, CISTI completed the automation of the delivery part of the chain, replacing the photocopying process with scanning, and enabling the automatic routing of the scanned image to the client's preferred delivery method. This end-to-end automation of Document Delivery was launched under the name IntelliDoc, and has facilitated CISTI's position as one of the world's major document suppliers. In 1995, IntelliDoc was given an award by the publishers of *Canadian Business* to mark the "design of a remarkable solution in information technology". The contractor who participated in the development of IntelliDoc went on to develop and market the product under the name of Relais.

In fall 1993, another innovative information product was released in cooperation with the National Library of Canada. Romulus was a CD-ROM version of the union list of serials in Canadian libraries that CISTI and the National Library of Canada (NLC) had been producing in database form for many years. Romulus was unique in that it also included custom telecommunications software for creating EDIFACT-encoded document orders that could be sent automatically to CISTI, NLC and other Canadian libraries. In 1994, Romulus won the Canadian Library Association/Mecklermedia Award for Innovative Technology.

Scientific Numeric Databases

Although most of the information products and services developed by CISTI have focused on bibliographic data of various kinds, the CAN/SND service focused on providing access directly to source data, specifically to critically-evaluated scientific numeric data. The CAN/SND service started in 1980, under Dr. Gordon Wood, emphasizing the dissemination and production of scientific numeric databases, as well as performing searches on behalf of clients, and doing research into data storage, retrieval and analysis techniques (7). The system included thirteen highly technical international numeric databases related to analysis, molecular structure and molecular biology.

Two factors contributed to the success of CAN/SND during that period. The first was the range of international collaborations, reflecting the stature accorded CISTI and NRC in making the information available. The second was the availability at NRC of the high-speed research networks, such as BITNET and Netnorth, which permitted the reliable exchange of data at high-speed and low cost. The result was a unique service, the only site in the world offering all of the crystallographic databases in one place.

Internet And Web Technologies

CISTI, working with network experts elsewhere in the NRC, embraced the Internet at a very early stage. John Curley was instrumental in securing CISTI's key role within NRC in Internet development. This led to NRC and CISTI participation in CANARIE research,

"facilitating the widespread adoption of faster, more efficient networks and enabling the next generation of advanced products, applications and services to run on them" (8) and subsequently CA*net, a high-performance backbone linking research institutions across Canada. From the beginning, the National Research Council played a key role in the technical management of these high-speed networks, providing CISTI with ready access to key high-speed and high-performance telecommunications resources

In 1993 CISTI co-hosted the AGARD (Advisory Group for Aerospace Research and Development) conference on International High Speed Networks for Scientific and Technical Information (9). At that time CISTI was exploring use of the Internet to deliver scanned documents to customers. In order to remain in tune with current issues and developments, CISTI has long been, and remains, a member of both the World Wide Web Consortium (W3C, which legislates how the web evolves) and the Coalition for Networked Information (CNI).

As a result of its expertise in Internet technology and access to appropriate servers, CISTI was asked by NRC to develop and host NRC websites, both internal and external. In 1994, CISTI also started hosting websites for external organizations, particularly other Canadian government departments that have difficulty hosting an external website themselves because of serious firewall restrictions. This service was offered on a fee basis, providing some revenue and the opportunity to explore innovative solutions to problems. Among many sites designed was the Website of the Technology Foresight Network of the Asia-Pacific Economic Cooperation (APEC) at

http://www.apectf.net/index.cfm that was launched in September 2001 in Bangkok, Thailand. The website is the virtual cornerstone of this new network.

In 1999, CISTI released a new product known as Biblionet, a purely web-based service, intended to provide electronic resources to the information technology and telecommunications sector. Although it was less successful than anticipated, it provided CISTI with experience in hosting electronic resources that have contributed to the success of other web-based products.

NRC Research Press

Although it was merged with CISTI only in 1994, the NRC Research Press has a long and equally respected history. The NRC began publishing journals in 1929, in response to a perception that Canadian scientists had limited access to the scientific journals of the time, and therefore that their work was not being adequately disseminated. The first issue of the first volume of the Canadian Journal of Research appeared in May 1929 at a subscription cost of $3.00 for one year. The success and growth of the NRC Research Press has reflected both the growing prestige of the NRC itself and the explosive growth in scientific publishing worldwide.

From the beginning, the NRC Research Press relied upon the Canadian scientific community to produce and evaluate the intellectual content of the journals. Each journal has an editor-in-chief and a team of associate editors, all respected researchers in the

subject field, who together are responsible for receiving and accepting manuscripts and assuring peer review. The combination of scientific and editorial quality has contributed to the reputation enjoyed by the NRC Research press journals. They attract authors from around the world and are distributed to over 12,000 subscribers worldwide.

Realignment Of CISTI

In the early 1990s, a number of transforming events were being played out in Canada and in the STI industry worldwide. The soaring cost of scientific journals was putting pressure on CISTI's customers, particularly the academic libraries, to reduce collections and investigate alternative strategies for delivering information to their customers. At the same time, there was growing pressure on world governments to rein in their spending, allocating less money for public institutions such as universities and libraries, and forcing a greater reliance on revenue-generation and cost recovery. Concurrently, the explosive growth of the Internet and the worldwide web offered a cost-effective medium for exchanging information worldwide. The Internet as well as economic pressures contributed to instability among some of the major players in the STI industry; companies merged, were acquired, or disappeared, leading to much greater concentration and vertical integration.

These effects were felt very strongly at CISTI, where the financial pressures were compounded by a falling Canadian dollar. They culminated in 1995 in a number of transformational policy decisions.

Beginning in the mid 1990s, the extensive paper research collections in the Ottawa-area NRC branches were drastically reduced, replaced by a Virtual Library that offered immediate access to a broader range of electronic resources, supplemented by the face-to-face services of librarians and free Document Delivery. At the same time, access to the electronic sources in the Virtual Library permitted regional branches to reduce their paper collections, and offered CISTI the flexibility to provide information services to new NRC institutes wherever they might be created.

The CAN/SND service was terminated in 1995, recognizing that with the growth of the Internet and better access to local computer resources, users could have direct access to the data. CAN/OLE was likewise terminated in July 1995, due to changing market conditions and the increasing availability of electronic information from other sources. Also terminated were the Health Sciences Resource Centre and the Translations Index. More emphasis was placed on current awareness to scientific researchers, and CAN/SDI evolved, first into InfoAlert, and finally to CISTI Source. At the end of this restructuring, CISTI was able to focus on marketing its three principal business lines (Document Delivery, Research Press and current awareness) to generate revenue to support Canadian/NRC services and initiatives.

3. GOVERNANCE AND ADMINISTRATION

CISTI is one of some twenty institutes of the National Research Council of Canada. The Director-General of CISTI reports to the Vice President of Technology and Industry Support. CISTI managers and staff are active within NRC, participating in NRC committees and working groups at all levels.

Since 1984, CISTI has been funded from the NRC envelope. However, this direct (A-base) funding is not sufficient to maintain the collection and engage in information product and service delivery to the degree or quality that CISTI aims for. The remainder of its operating budget must be funded through fees charged for services. Through a special arrangement with Treasury Board, CISTI is permitted to retain a portion of the revenue it earns through providing services, which it can then re-invest in the collection or new service development.

CISTI supports NRC in fulfilling its Vision by providing the expertise and infrastructure to deliver STM information to Canadian researchers and innovators, when and where they need it. Through its online services and its seventeen NRC Information Centres located across the country, CISTI is accessible to Canadians, both virtually and in their regions. CISTI's presence in NRC institutes, consortium agreements with Canadian university libraries, support to the peer review system, and close links with the Industrial Research Assistance Program (IRAP) ensure that CISTI is known and used by all sectors of Canada.

IRAP is another information-based institute in NRC. Established in 1947, as the Technical Information Service, it was merged briefly with the National Science Library in 1974 to form CISTI. This merger was of short duration, as the two groups had differing priorities and mandates. IRAP is designed to help Canadian small and medium-sized enterprises (SMEs) meet the technological challenges they face in delivering new products, processes or services. CISTI staff and IRAP's scientists and engineers share the objective of using scientific, technical and medical (STM) information to foster industrial innovation and development, and often work together.

CISTI is guided at a strategic level by an Advisory Board, which reports to the NRC Council. The Advisory Board is made up of leading national and international stakeholders from the academic, business, library, and publishing sectors. Its members are appointed by the NRC Council and serve renewable terms of from one to three years. The Board plays an important role in ensuring that external stakeholders provide key advice to Council and the NRC Executive on the strategic directions, management and overall priorities of CISTI.

CISTI Vision, Mission and Strategic Direction

CISTI recently completed its Strategic Plan for the period 2005-2010 (10). The document describes CISTI's vision to be "A leader in driving the exploitation of scientific information to create value for Canadians."

The mission of CISTI is "to advance research and innovation through high-value information and publishing services in science, technology, and medicine."

The strategic directions embraced in the current Strategic and Operational plans are to:

- provide universal, seamless and permanent access to information for Canadian research and innovation;
- enable STM researchers and entrepreneurs to advance and exploit knowledge through accelerated, innovative scientific communication; and
- lead STM information communities across Canada to become a national force for innovation.

CISTI's role is a multi-faceted one. CISTI is at various times a public-good institution providing services to, and fostering economic growth among, researchers and research organizations in Canada; a fee-based information provider delivering copies of scientific articles to customers around the globe; a scholarly publisher of peer-reviewed journals with an international reputation for excellence; a participant in multilateral national and international information organizations. CISTI also still remains, as it started, the library of the National Research Council and its nearly 4,000 employees across Canada.

Partnerships

In order to expand its resources, extend its reach and deliver products and services, CISTI collaborates with well over 100 organizations. Within Canada, all academic libraries are

connected to CISTI through consortium agreements. CISTI has close ties to the Canadian Agriculture Library with which CISTI shares both a catalogue and a document delivery service, and to other federal government libraries through the Council of Federal Libraries (CFL), of which the Director-General of CISTI is the co-chair. The Strategic Alliance, a subset of the CFL, is investigating site licensing of scientific journals for federal government researchers. CISTI is also an active member of several national and international library organizations.

From an international perspective, CISTI has entered into partnerships with a number of its counterparts in other countries such as the Institute of Scientific and Technical Information of China, the Korea Institute for Scientific and Technical Information, the Science and Technology Information Center in Chinese Taipei and the Institut de l'information scientifique et technique in France. The British Library Document Delivery Centre in England is one of CISTI's partners in the Document Delivery service. CISTI's long-standing relationship with the U.S. National Library of Medicine has provided Canadians with online access to the world's medical literature since the early years of MEDLINE. Numerous gateway agreements extend the availability of our Document Delivery service to clients in the United States and around the globe.

The NRC Research Press has close ties to many scientific societies, and several of the NRC Research Press journals are their official society journal. The Press is served by a growing list of online distributors, aggregators and gateways that facilitate access to its scholarly publications.

Through the efforts of Dr. Gordon Wood, CISTI has had a long and fruitful relationship with CODATA (the Committee on Data for science and technology) http://www.codata.org/. CODATA aims to address issues surrounding scientific data per se, a multidisciplinary subject that is basic to all science. Since 1986, CISTI has hosted or co-hosted several CODATA-related meetings. In the early 1990s, CISTI took over direct responsibility for the CODATA national committee. CISTI's active participation in CODATA provides an opportunity for CISTI to be in direct touch with the international scientific community.

4. COLLECTION

CISTI is recognized as having one of North America's leading collections of scientific, medical, and technical information. The collection is managed as a national asset with attention to collaborations with other STM libraries in order to minimize duplication of resources and maximize access to STM information for Canadians. CISTI's collection policy takes into account the strong national specialty collections such as those held by the Canadian Agriculture Library (CAL), the Earth Sciences Information Centre, and the libraries of Environment Canada and Transport Canada.

CISTI's main collection is located in Ottawa. Working collections are also located in centres co-located with regional institutes to serve NRC. Some of these have special or unique collections; of particular note is the Astronomy collection in Victoria, British

Columbia. The CISTI collection includes more than 50,000 different serial titles including journals from the world's leading scientific publishers, more than 600,000 books, conference proceedings and technical reports, and two million technical reports on microfiche from around the world. CISTI makes a special effort to identify, locate, purchase and catalogue conference proceedings from around the world and has an excellent collection. CISTI also maintains a large collection of scientific, technical and medical translations including articles, conference papers, patents, reports, cover-to-cover journal translations, series and books. In addition to the paper documents, CISTI has licensed access to 3,000 online journals for use by NRC staff nation-wide, through the Virtual Library.

The collection is one of the largest of its kind in North America and in some cases offers the only North American location for a particular journal. CISTI continues to subscribe to journals that other Canadian libraries can no longer afford, although maintaining a comprehensive collection of both print and electronic media is a major challenge for CISTI with the rising costs and the astounding rate of growth in the output of scientific and technical literature. Stakeholders regard CISTI as Canada's national repository for the world's STM literature and want assurances that Canadians will always have access to this unique resource. Libraries serving the scientific, technical, and health communities in Canada are able to justify gaps in their own collections by relying on CISTI's collection.

5. DOCUMENT DELIVERY

CISTI offers a Document Delivery service to anyone in the world who requires STM information. The service is based upon delivery from CISTI's collection, but goes beyond the collection to locate and deliver documents on any subject from anywhere in the world. CISTI's Document Delivery service is facilitated and supported by the IntelliDoc system, an integrated system that has automated nearly all sub-processes and resulted in improved performance and increased capacity with no increase in staff.

Clients can order documents electronically from CISTI in a wide variety of ways. Organizations with their own bibliographic database are invited to add an interactive ordering link to CISTI, a process that is being simplified through OpenURL. Clients who cannot make use of any of these options may submit orders by fax, e-mail free-text, telephone or mail, for a slight surcharge.

CISTI also delivers documents in a variety of ways. Ariel is by far the most common. CISTI worked with Ariel's original parent, the Research Libraries Group, for many years to ensure that Ariel works seamlessly with IntelliDoc (11). Secure Desktop Delivery was released in 2003. Where permitted by license from the publisher, an encrypted PDF document is posted to a client's directory on the CISTI web server. Encryption forces communication with a server database for permission to display or print each article; permission for each is granted once only. CISTI is actively engaged in negotiating these publisher licenses, to facilitate desktop access for all customers. Documents are also

delivered by fax and by courier. Clients are notified either by e-mail or fax. Loans are sent by courier.

There are three levels for Document Supply: Direct, Link and Global. Orders filled at the Direct level are supplied from CISTI's collection or from the Canadian Agricultural Library. Most orders are filled within 24 hours. Documents not held at CISTI can be filled at the Link level, if specified by the customer. CISTI has Link partnership agreements with seven organizations as of 2005. Most documents are sent by Ariel or fax directly to the customer within 72 hours. Orders that cannot be filled by CISTI or its Link partners are filled at the Global level, if required by the customer. Global orders are filled from anywhere in the world, from organizations in academia, industry and government as well as through special collections, publishers, authors, and commercial document delivery suppliers. Orders are usually filled within four weeks and CISTI handles order tracking, billing and payments, copyright, control of loans and delivery of documents.

For customers with specialized requirements, CISTI offers a range of Custom services. CISTI's Urgent service guarantees document delivery by fax or Ariel within two hours during CISTI's business hours, or there is no charge. If the document cannot be supplied, the client is notified within two hours. Longer documents and loans are shipped by overnight courier. CISTI can provide 'clean copies' with superior resolution of graphics and without smudges, marks or staples. Clean copies may be required to accompany legal or regulatory submissions. CISTI can also deliver colour copies when required. Special handling can be requested to meet special needs, such as inclusion of advertisements or

other unindexed information. Clean and colour copies and those with special handling are sent by courier.

CISTI is known for its excellent turnaround time. IntelliDoc helped reduce the turnaround time to hours rather than days. A service contract with an external contractor has extended the workday, so that documents held in the CISTI collection can be delivered electronically to North American clients in any time zone on the same business day. Service to customers is the hallmark of Document Delivery.

A special aspect of client service is the treatment of publishers as customers. CISTI takes its responsibility to report and pay copyright to copyright holders very seriously. Where special agreements have been negotiated with publishers, CISTI makes royalty payments on a regular basis to each publisher, with detailed usage reports (excluding client information). Where there is no special agreement, CISTI pays the appropriate copyright collective. In the future, CISTI will seek agreements with publishers to allow the delivery of documents from electronic sources through IntelliDoc or directly using Pay-per-view.

6. NRC RESEARCH PRESS

NRC Research Press is the largest scientific publisher in Canada. Among not-for-profit publishers, the Press is unique in the variety of disciplines reflected. Many of their titles rank among the top two or three journals in the world in their field. As of 2005, the Press manages the publication of 15 journals and has expanded from journal publishing into publication of books and conferences proceedings and into contracting of publishing services. The list of publications and services associated with the Research Press as of 2005 is available at http://pubs.nrc-cnrc.gc.ca/rp2_home_e.html. Approximately 9,500 authors submit manuscripts for RP journals each year. Peer review, the critical element of scientific publishing, culls that number to 6,000 accepted for publication, almost half from Canada. The peer review process itself serves the scientific community by providing free advice on submitted research. The Editor, editorial board and reviewers are all distinguished scientists in their fields.

An impressive 85 percent of subscribers come from outside of Canada. The majority are university researchers. The journals have been offered online since 1997 as individual or site-licensed subscriptions. Another aspect of electronic publishing is the ability to cross-reference online articles. All online articles published by the NRC Research Press since 1996 have been reported to CrossRef, which allows other publishers to build reference links to these articles.

The journals became available on an article-by-article basis with the introduction of "pay-per-view " in 2002. The technology was designed to be applied to other applications within CISTI and NRC. Pay-per-View provides instant access to full text documents through payment of a modest fee by credit card. The application allows online authentication and authorization of credit card sales via a secure server.

Access to the electronic version of RP journals is available free of charge to Canadians who are using a primarily Canadian-based Internet Service Provider. This has been made possible through the Depository Services Program of the Government of Canada. The Program aims to provide Canadians with ready and equal access to federal government information. NRC Research Press journals will also be made available to developing countries at a nominal cost through the Programme for the Enhancement of Research Information (PERI).

Book publishing was introduced in 1997 and has grown into a successful venture with twelve to fifteen books published each year. These are primarily research works, with some titles of general interest. In 2002, the Research Press launched a Biography Series, beginning with Gerhard Herzberg, one of the greatest scientists of the twentieth century and the 1971 Nobel Laureate in Chemistry.

The NRC Research Press recently launched a flexible, powerful and convenient Web-based manuscript submission and peer review system. Known as OSPRey, the name not only stands for Online Submission and Peer Review, but also for the bird native to both

Australia and North America. The system was co-developed by CISTI and the Commonwealth Scientific and Industrial Research Organisation (CSIRO). The system allows authors to register and submit manuscripts quickly and easily. Through e-mail messages from the editorial office, web-based peer review and a technical support service, authors can stay abreast of the status of their manuscript submission and troubleshoot any difficulties they may encounter. In addition, users can take advantage of single sign-on, whether as an author, reviewer, associate editor or editor, and can review or submit manuscripts from anywhere in the world via the web.

7. DIGITAL LIBRARY PROJECTS

CISTI has a forty-year history of exploiting automation in the delivery of information services.

Current Awareness

CAN/SDI, an automated current awareness service, was the first automated service provided by CISTI, launched in 1968. Current awareness has evolved continuously over the intervening years. CAN/SDI's web version, called InfoAlert, offered clients more capability to create profiles, obtain references and order documents online. At the same time, a Table of Contents service called SwetScan was launched in the early 1990s, based upon weekly updates from Swets & Zeitlinger in the Netherlands. Customers could

search the article database, create subject profiles, and order documents. Finally, in 1999, came CISTI Source, an improved current awareness service combining the best features of InfoAlert and SwetScan.

CISTI Source contains tables of contents of 20,000 journals, worldwide, in all subject areas, from 1993 to present. Approximately 65 percent of the journals are in the fields of science, technology and the health sciences. Users can search by subject, set up current awareness profiles by subject or by journal, and order documents.

For customers with site licenses, access for all members of the organization is allowed by IP address as well as by account and password. Organizational subscribers can link the ordering functionality to their own catalogues, so that orders can be blocked for journals held locally.

e-Infostructure

As more and more STM information is produced and accessed electronically, it is important to take action to ensure perpetual access to these essential resources. Currently, access depends on the signing of annual agreements and the long-term stability of the publishing houses and societies that own the journals. The potential for the loss of access to these web-based virtual resources is a crucial challenge to Canada's information sovereignty.

CISTI is upgrading the infrastructure for locally loading electronic journals and other digital content. The new electronic (e)-infrastructure will exploit state-of-the art enterprise architecture principles, making it robust, flexible and scalable. When the infrastructure is complete, functionality for remote authentication of users, authorization to services, and digital rights management will be enhanced, providing a platform for ensuring long-term access to the world's electronic journals for all Canadians. Initially, licensing restrictions will restrict this electronic access only to NRC, but CISTI's vision is to negotiate permission to extend access to the wider Canadian research community. CISTI continues to explore the varied scenarios by which users access electronic information, in order to identify other ways in which it can take a leading role in providing broad and enduring access for Canadians.

CISTI is a member of the Strategic Alliance of Federal Science and Technology Libraries, an alliance of the libraries of the science-based departments and agencies in the federal government. Members of the Alliance collaborate on creating key information resources for federal STM workers. The Alliance has proposed the creation of a Federal Science e-Library that would provide seamless desktop access to electronic journals to federal government researchers, analysts and decision-makers. This e-library would be based upon the infrastructure developed at CISTI.

Research

A small research group within CISTI is involved in applied research and development of proof of concept for potential new tools, and directions for information management and dissemination. The group is also investigating potential collaboration and partnerships with researchers in universities and other organizations. CISTI shares a staff member with NRC's Institute for Information Technology (IIT). IIT's mandate is to perform pure research in the IT field, and CISTI works with IIT to provide real applications in an actual information setting.

8. INNOVATION IN SERVICES

The National Research Council has gradually expanded its presence across Canada, growing from two divisions outside of Ottawa in the 1970s to ten regional Institutes and additional regional research facilities for some Ottawa Institutes by 2005. CISTI has nineteen NRC Information Centres. It is a part of NRC's strategy to create regional technology clusters that can respond directly to specific and focused areas of development. The reduction of Ottawa-area branches in 1995 and the development of a Virtual Library have helped CISTI respond to this expansion, providing information services to NRC staff wherever they are.

The NRC Information Services (NIS) Directorate is CISTI's main link to the rest of the National Research Council of Canada (NRC). NIS operates NRC Information Centres (NICs) across Canada serving NRC staff as their primary clients but also providing some

support to small and medium-sized industry either directly or through IRAP. In addition to centralized CISTI products and services such as Document Delivery, CISTI Source and the Virtual Library of electronic resources, NICs provide many value added services to NRC researchers, including searching and analyzing STM literature, patents and trademark information, and providing competitive technical intelligence (CTI)

A new CTI program is being offered as a team effort between NIS' Technical Business Analysts and Information Specialists, and IRAP's Industrial Technology Advisors. The goal of CISTI's CTI Program is to ensure that the decision-makers in small technology-based businesses get the best analysis of available technical information. By spotting the technological trends and getting a sense of where their competitors are headed, these businesses can get better results and return from their investments in R&D, and do better planning for their own future success.

Figure 1 gives an overview of the NRC Information Centres across Canada.

Other services to NRC

The NRC Archives operates under the umbrella of the Canada Institute for Scientific and Technical Information. It is involved with the preservation of archival material, acts as a resource center and provides ongoing support to NRC history projects.

NRC Expertise is a database developed by CISTI staff to promote awareness of NRC expertise. It provides a direct link to more than 1,700 NRC employees who have scientific, technical and professional expertise to share with industry, academia and other government departments. Since its release in 1998, the database has continued to be administered by CISTI and has been accessed by users from all over the world looking for potential colleagues, partners and customers.

Building on its success with the Virtual Library and the Expertise database as tools that foster information exchange among researchers, and its experience with web development, CISTI has taken the lead within the National Research Council in Knowledge Management. In particular, CISTI is exploring the use of collaborative software within the Council, and proposing infrastructure development to support information exchange leading to innovation.

Services To Canada's Medical Community

CISTI has had a long and fruitful relationship with Canada's health sciences community. Although the Health Sciences Resource Centre was disbanded in 1993, CISTI still retains responsibility for the coordination of health information services, and liaison with the National Library of Medicine. CISTI is the Canadian coordinator for Medline and DOCLINE, and provides support to Canadian libraries that use DOCLINE for ordering. NLM will soon be joining the Electronic Funds Transfer System (EFTS); once it has been rolled out to all the regions in the US, Canadian libraries will be invited to join, and CISTI will provide support to those who need assistance. As well, CISTI's Document Delivery service will implement EFTS.

CISTI's Committee on Health Sciences Information meets twice a year, bringing together representatives from the health library associations in Canada. The committee made recommendations in 2001 that CISTI expand its collection to include more health sciences journals and an additional 163 titles have since been added.

9. INNOVATION IN MANAGEMENT

CISTI Management

CISTI, as a part of the National Research Council of Canada, is bound by the regulations that apply to the management of departments in the Government of Canada. The NRC has resolved to become an employer of choice for scientific researchers, a commitment that is embodied in a *Vision to 2006* (12). This vision is based upon five pillars, the first two of which relate directly to Management – 'Outstanding People, Outstanding Employer'; and 'Excellence and Leadership in R&D'.

To aid in implementing this vision, NRC has adopted an Employment Philosophy, which seeks to recruit and retain and reward outstanding people and to provide them with significant opportunities for professional, scientific and creative development. CISTI also embraces the Vision and the Employment Philosophy as key elements in management.

One result of this philosophy has been the development of a Competency framework that allows NRC to recruit, train, manage and promote based upon a common suite of criteria. These are criteria that have been proven to contribute to success in research organizations, based upon behavioural competencies rather than technical skills. These competencies include results orientation, leadership, client focus, and conceptual and analytical ability.

Employees are increasingly realizing the need to balance work with quality of life, and in recognition of this fact, NRC provides opportunities for Alternative Work Arrangements (AWA) including part-time work, job sharing and telework.

The Employee Advisory Forum (EAF) was established in 1996, to serve as a link between CISTI employees and management. Representatives from all Directorates assist in the planning and implementation of internal initiatives. These representatives also serve as a resource for CISTI employees. The Chair represents EAF issues and concerns at biweekly CISTI management meetings. In turn, the Chair presents CISTI management's response to these issues at the EAF monthly meetings. The EAF also sponsors workshops for staff and brings Weight Watchers to work.

As part of the drive towards one-day turnaround time, CISTI investigated options for staffing the scanning, printing and delivery functions of Document Delivery late into the evening and on weekends and statutory holidays. The optimum solution was found to be contracting these after-hours activities to an external contractor. This same process is being used to provide after-hours support to CISTI's Urgent service, in order to provide Urgent service during working hours in all Canadian time zones.

10. CONCLUSIONS AND FUTURE

STM information is widely acknowledged as the key to the innovation system, and CISTI is ideally positioned to acquire, organize, deliver and interpret this information to the innovators and decision-makers in Canada and worldwide. As a publisher as well as a library, CISTI is poised for a future in STM information and is a key strategic component of Canada's science and technology infrastructure

The transformation from print to digital has created enormous change in the world of STM information. CISTI is a world leader in using new methods to aggregate, analyze, and deliver that information. As outlined in the *CISTI Strategic Plan 2005-2010,* CISTI will improve the flow of scientific information in three ways:

- An integrated "infostructure": electronic access to scientific information, using intelligent search and analysis tools

- Scientific publishing infrastructure, using online peer review, editing and publishing tools that will shorten the time between discovery and publication without sacrificing quality

- Services to support commercialization, such as Competitive Technical Intelligence and Patent information analysis - what can be called "actionable" information.

CISTI is establishing the collaborative agreements, partnerships, systems and practices required to carry out all stages of providing STM information online. CISTI's paper-based collection, the foundation of its services since 1924, will remain a significant national asset. CISTI intends to nurture existing relationships and develop new ones to ensure that clients benefit from access to extended information resources, that scholarly publishing grows its network of contributors and that the organization remains well positioned internationally.

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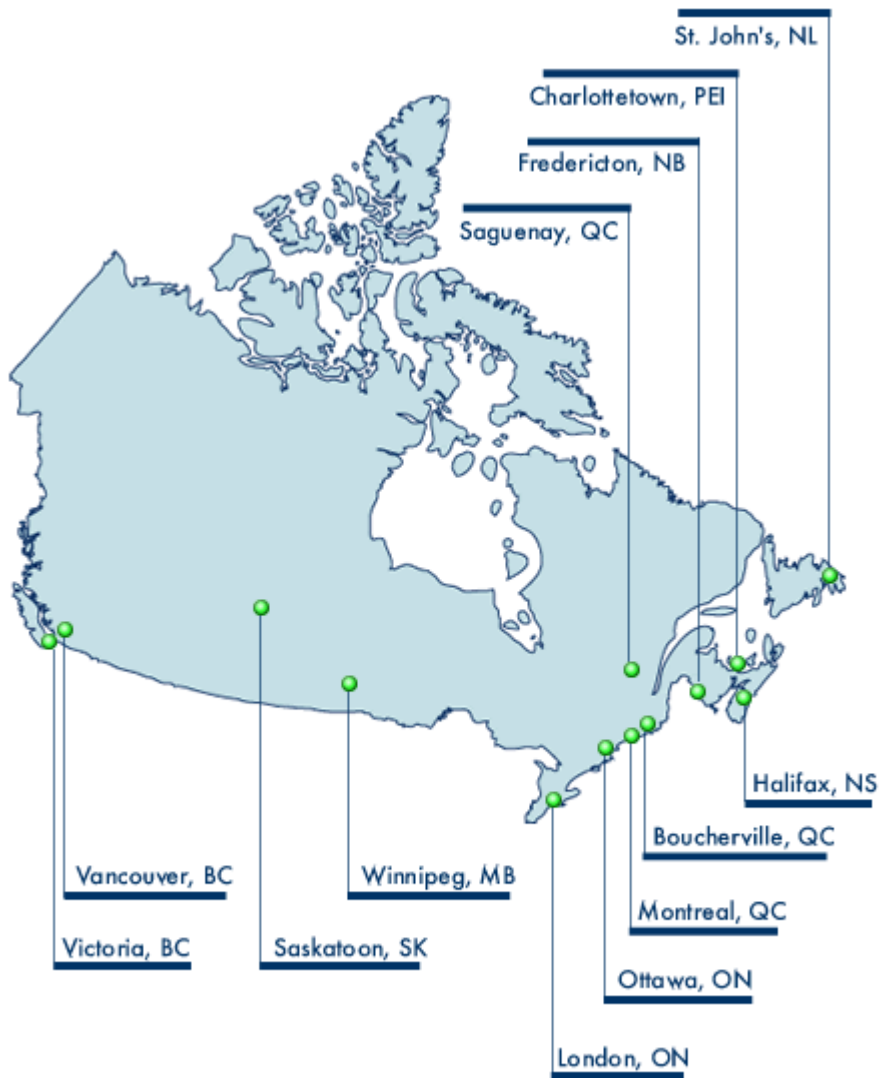
Figure 1. - NRC Information Centres Across Canada

FURTHER READING --- {This part may have to be excluded because of space constraints}

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