

THE EVOLUTION OF THE WAVES DATABASE: FROM KWOK INDEX TO THE WEB

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ABSTRACT: On the 25th anniversary of IAMS LIC, the authors consider some of the technological changes that have affected libraries over the past quarter century. In particular, they discuss the WAVES/VAGUES database. About 18 years ago, using as a base a KWOK index of one library's holdings, WAVES/VAGUES was begun, and has evolved into a union catalogue of the Council of Fisheries and Oceans Libraries (COFOL). Over the years, bibliographic standards were developed, the database was refined and made available

in various formats. Earlier this year, it made its appearance on the World Wide Web.

On the first day of April this year, it was no poisson d'avril or April fool's prank that the Council of Fisheries and Oceans Libraries (COFOL) announced Internet access to WAVES, the catalogue of the libraries of Fisheries and Oceans Canada. COFOL's WebWAVES is the most recent phase in the continuing development of a cooperative catalogue project that began almost twenty years ago.

The Canadian Department of Fisheries and Oceans was formed in 1979 when the Department of Fisheries and Environment split. The Fisheries and Oceans librarians met for the first time in 1980, carrying on the annual meeting tradition established by the librarians under the previous Department and forming the Council of Fisheries and Oceans Libraries (COFOL). At COFOL's inception, the member libraries with on-line access to their catalogues were running in-house systems, none of which was compatible with any other system. None of the member libraries had an on-line public access catalogue (OPAC). At that meeting library resources and catalogues of all the participants were discussed and compared. The participants included the head librarians from each of the Department's research facilities.

OPACs, which made their appearance in libraries in North America in the 1970s, had limited capabilities and could be characterized as merely extensions of card catalogues. (Beheshti, 1997) These early OPACs offered only a few access points and searching was limited to exact character by character matching. The systems were command driven and display options were restricted to brief records. The decade of the 1970s was a period of trial and error for automated library catalogues and some of the larger academic and public libraries were reluctant to adopt on-line catalogues. As well, even though libraries had begun automating aspects of their functions more than a decade earlier, there was still a reluctance to accept automation. It was not until 1974 that a library catalogue could be interactively queried by library patrons on a CRT (cathode ray tube) terminal (Su, 1999). By the early 1980s, the OPAC had become established in North American libraries; card catalogues were being closed in major libraries. By 1985 there were about fifty OPAC system vendors in the United States (Su, 1999). Characteristics of these second generation OPACs included Boolean searching, proximity operators, keyword access, and multiple display formats.

OPACs were in the last stages of the first generation OPAC phase by the time COFOL was formed. A cooperative catalogue of holdings of the Departmental libraries across the country was one of the topics of discussion at the early COFOL annual meetings. One library, the Scotia-Fundy library in Halifax, had developed a KWOK (keyword outside context) index of report literature using the computer services of its previous Department, Environment Canada. This index was constrained by the number of characters in some fields and was limited to uppercase. As a result, data were entered in abbreviated form in some fields. There was no thesaurus control, no authority control and no stop words. This

was a rudimentary database. As a method of storing and retrieval of grey literature and government documents, the database was inadequate and the technology was dated.

When the Scotia-Fundy library was notified by Environment Canada in 1980 that its computer services would no longer be available after Feb. 1982, the library staff began to investigate alternative methods of managing this information. Database management systems of the early 1980s were not the sophisticated systems that are available now. Data were input in batch mode and updating was done by schedule, such as weekly or monthly. After investigating a number of systems, the Scotia-Fundy librarian set up her database as a "private file" at a service bureau, Infomart, using Batelle's Automated Search and Information System (BASIS) software. Batelle had designed BASIS in 1973 as a tool for corporate librarians and information specialists who were familiar with early on-line services such as Dialog. The system provided index-based text retrieval as well as support for document attributes for cataloguing and abstracting. Using BASIS, Scotia-Fundy library's new database was much more flexible than the old one and features included an on-line retrieval system, some restrictions on field lengths, ability to add other libraries' holdings and authority control ability through thesauri. The attractiveness of this private file system was that the library could design its own database, create the number and type of fields required, create a list of stop words, create a thesaurus and a display format and, the database was searchable by all fields. Authority control could be managed with a separate database. The ultimate appealing aspect of BASIS, and this was considered to be advanced for the time, was that the library could use its own computer system to create and revise records. These records would be held in a "queue" file until the service bureau ran an update. There was considerable flexibility with the scheduling of updates which could be run weekly or daily.

When the Scotia-Fundy library presented a proposal to the other COFOL members to expand this database into a cooperative catalogue, the proposal was accepted, and by 1982 the WAVES1 project was underway. The database system was first operational at the Scotia-Fundy library with a file of 30,000 records imported from the original KWOK index. Next, tapes of the holdings of the Institute of Ocean Sciences and Pacific Biological Station libraries were loaded and the Ottawa library began creating records of its grey literature collection. During the middle and late 1980s each of the participating libraries agreed to assume responsibility for cataloguing reports in one or more of the major series held in common in the libraries. These responsibilities included indexing new additions to these series. (Sutherland, 1988) At this time, not all participating libraries were following established cataloguing practices and principles and a need for standards was recognized. Such standards included establishing authority records for corporate names and series and for species names. Between 1981 and 1985, "Standards for the format of data to be recorded in the WAVES/VAGUES database of the Department of Fisheries and Oceans Libraries" (Canada. Dept. Of Fisheries And Oceans. Library Services, 1981-1985) were developed and revised. These standards, known as the WAVES1 standards were applied to all records created in the database until 1989.

During this same period the libraries initiated a review of existing library systems and procedures within the Department. A study (HST Information Systems, 1986) recommended the implementation of a centralized library system. This study gave a time frame of 5+ years and cost of \$3.5 million. The mid to late 1980s was a time of fiscal restraint in the Canadian federal government and the commitment of such a long term, expensive project was not feasible. The libraries themselves initiated an internal study to provide a description of existing library systems and to evaluate the availability of existing systems that would satisfy the requirements of individual libraries and the library network as a whole. This study recommended that WAVES, the automated catalogue database, be enhanced and used as the union catalogue. Following this recommendation, the libraries engaged in an evaluation of "off-the-shelf" micro-computer based integrated library systems software. This study was completed in 1988 and two systems, Sydney and BestSeller, were recommended but neither system was fully able to provide promised functionality and neither was ever implemented. The libraries continued to add records to WAVES.

At this point, some information concerning more of the technological developments that have affected library systems is required. As mentioned earlier, library systems of the 1970s and early 1980s were comprised mainly of "host-based systems utilizing primarily proprietary operating systems on dumb terminals with command or menu-driven user interfaces and offering a very modular product built in pieces" (Stearns, 1999). Significant changes in micro-computer technology, such as the development of open system architecture and portable software, occurred during the 1980s. "Proprietary vendor-developed operating systems gave way first to hardware-specific operating systems and finally to so-called open operating systems, meaning Unix-based products" (Stearns, 1999). In the mid-1980s, while dumb terminals still dominated, personal computers (PCs or micro-computers) began to be introduced by the library system vendors. The mid-1980s brought a transition from large scale integrated technologies to micro-technologies. The library applications providers began combining several library activities into one integrated system. For example, circulation and OPAC functions, initially sold as stand alone applications, were combined with acquisitions and cataloguing applications. These systems are referred to as integrated library systems (ILS). (Pasquinelli, 1997) Data entered in one module of an integrated system can be used in another module. A typical ILS offers an OPAC and modules for functions such as cataloguing, circulation, acquisitions, and serials management. Some systems may offer interlibrary loan facilities as well (Wilson, 1997). A survey available at the Integrated Library Systems Reports Website (<http://www.ilsr.com/>) provides information on thirty-seven ILS vendors and the more than fifty products they have developed and currently sell. In summary, by the end of the 1980s, libraries were well on their way to incorporating developments in communications systems, relational databases and information distribution technology into their systems. Using PCs, they had introduced networked environments. Networking allowed libraries to approximate the capabilities of large-scale systems by using cost-effective micro-computers and sharing expensive peripherals. The use of PCs also provided flexibility in terms of licensing and sharing software (Almquist, 1997).

In the mid-1980s, the development of WAVES moved into a new phase with the beginning of the WAVES2 project. The National Library of Canada had expressed an interest in the Fisheries and Oceans Canada libraries reporting their holdings to the national union catalogue. Reporting meant records had to conform to AACR2 standards. At the 1987 COFOL annual meeting, terms of reference for an Automation Advisory Committee, which included the revision of the existing standards, were approved. The results of the work done by the Committee, the "WAVES2 standards for the format of data to be recorded in the WAVES/VAGUES database..." were released in 1989. These standards, among other details, covered the WAVES exceptions to AACR2R (Conroy 1991). Generally, WAVES cataloguing practices follow AACR2R, but there are several exceptions, some of them related to the bilingual nature of many of the materials catalogued by the libraries. A considerable amount of time was devoted to the development of standards for the WAVES database. The libraries explored options to reconcile the non-compliance of WAVES records with both AACR2R and MARC. All records entered into the database prior to 1989 are non-AACR2R and non-MARC compliant. The WAVES2 standards apply to new records entered into the database after 1989. These newer WAVES records do conform to AACR2R and where there are exceptions to the rules, WAVES records do include all the elements required by AACR2R with some added elements. As for MARC, while WAVES does not use MARC tags, most fields in WAVES records can be mapped to MARC fields.

COFOL now had a union catalogue with standards for entering data, but not an OPAC. On the technology front, developments that eventually would be incorporated into OPACs continued. During the 1970s and 1980s, several alternatives to magnetic-tape storage were being developed. Optical disc technology was seen as an attractive medium for high density data storage (Mass 1987). By the mid-1980s several libraries had adopted the compact disc or CD-ROM (compact disc read only memory) as a format for their library catalogues. The CD-ROM catalogue provided an inexpensive alternative to the large integrated library systems that had dominated libraries since the early 1970s. The CD-ROM catalogue offered a combination of large data storage capability, reasonable production cost, and computer-based searchability (Besier 1988). Some disadvantages posed by the CD-ROM catalogue were the delay time in updating the databases and the limitation to the one-user/one-workstation framework (Maxymuk 1996).

At this time, WAVES was still stored at and accessible only through the service bureau and the costs of storage and access were increasing. As a result of this arrangement, WAVES was accessible only to the Departmental librarians. The primary library clients, Departmental staff, as well as clients outside of the Department were demanding access to WAVES. Extending accessibility to these clients became the next focus of activity. Seizing on the CD-ROM technology, COFOL initiated an evaluation to assess the feasibility of the format as a distribution medium for WAVES. In 1990, WAVES CD-ROM VAGUES was released, co-published by the Canadian Government Publishing Centre and a private company, Optim (Marshall 1992). WAVES CD-ROM VAGUES

was the first Canadian government database to be released in CD-ROM format. With the availability of the database in this format, the holdings of Fisheries and Oceans Canada libraries were accessible for the first time to Departmental employees working in facilities without libraries. Additionally, it was accessible to any library or individual who chose to purchase the CD-ROM. WAVES CD-ROM VAGUES was updated quarterly, which meant that even though users had access to WAVES on a regular basis, the CD-ROM product could be up to three months out-of-date.

The original five year publishing agreement with Optim provided the Department with a number of copies of the CD-ROM, enough that each library had at least one copy. At the end of the five year period, Optim, which had become Dataware, did not renew the publishing agreement. Another Canadian service bureau, Micromedia, expressed interest in WAVES for their Internet service and for a CD-ROM. COFOL agreed to provide the database to Micromedia, but made it clear that COFOL's intention was to make WAVES available free of charge via the Internet. Under the publishing agreement, the WAVES database is shipped to Micromedia on a quarterly basis which means that their Internet and CD-ROM products, similar to the earlier Optim and Dataware CD products, can be up to three months out of date. We're getting ahead of ourselves here, but we will mention that even after WebWAVES became available on the Internet, Micromedia decided to continue producing their Internet and CD-ROM products because of customer demand.

By the end of the 1980s, COFOL, concerned with the costs for storage arrangements of their database at a service bureau, began to push forward with WAVES3, the project to gain control of the WAVES database by moving it in-house. In the early 1990s, COFOL established an Integrated Library System Committee to identify and evaluate ILS software. Since the ILS was going to be used by all Departmental libraries, a process of implementation by committee developed. From the number of systems examined by the Committee, Information Dimensions' TechLib Plus was recommended. (Information Dimensions, 1998) In 1994, TechLib Plus was acquired and installed. The system is housed on a server at National Headquarters in Ottawa. A Systems Librarian, responsible for system management, was added to the staff at the Ottawa library in 1996. The cataloguing module and OPAC, in English and French, were implemented first, then the circulation module, and finally the serials module. WAVES OPAC has all the usual OPAC features as well as on-line thesauri of corporate, series and species names. Authority control through these thesauri is available in the cataloguing module.

The CD-ROM version of WAVES was the first effort in making the holdings of the Fisheries and Oceans Canada Libraries accessible to Departmental employees as well as clients outside of the Department. The next endeavour would extend the database to a much larger community. That is the community of the Internet, a world wide network of computers. The Internet had grown out of in an American defence communications system developed in the late 1950s and several communications networks for academic researchers that developed in the 1960s and 1970s. (Kantrowitz, 1994; Krumenaker 1993; Pastan, 1996) Libraries were quick to embrace this new technology and in ever increasing

numbers, library catalogues and services become available through the World Wide Web, a hypertext based Internet service providing information and resources. Web OPACs appeared at an astonishing rate, facilitated by the intuitive nature and attractiveness of the user interfaces available through Web technology (Burton 1995).

By 1995, Fisheries and Oceans Canada had established its presence on the World Wide Web with both national and regional Websites. While the existence of the libraries was mentioned, the catalogue was not available. Making WAVES available on the World Wide Web was discussed for the first time at the annual COFOL meeting in 1994. A Web-based version would provide access to the library catalogue for employees who did not have access to the Departmental network. As well, libraries outside of the Department would gain access to the holdings of the Fisheries and Oceans Canada libraries.

COFOL established a WebWAVES Committee who were instrumental in developing and recommending the design of the Web interface for WAVES. Getting WAVES to the World Wide Web was a project undertaken by the WebWAVES committee as well as some Departmental employees from the Information Technology and Communications Branches. Since TechLib Plus is a product of BASIS, the BASIS WebServer software was used to design WebWAVES. The software was customized to meet the needs of the COFOL libraries and to give the site a Departmental feel. An example of this is the inclusion of the WAVES logo as a button. Because Canada is a bilingual country and all publications of the federal government must be available in both English and French, most of the applications had to be customized and all "help" files made available in the two official languages. Since the Website itself had to be totally bilingual, the Committee had to make two versions of the interface: WebWAVES and WebVAGUES. Other stylistic additions to conform to federal government guidelines and Departmental standards included Departmental toolbars, copyright information and disclaimer. The nature of the Web promoted the inclusion in WebWAVES of features that were not available in WAVES OPAC, for example links from the library location code to contact information for the library. However, this feature will be available in WAVES OPAC once the next version of TechLib Plus, which is Web-based, is implemented. Before WebWAVES could be launched, a few other problems had to be resolved. There was no precedent in the Department for a Web application such as WebWAVES and the Department had not yet finalized its Internet policies. Security issues were resolved by putting WebWAVES on its own server behind the firewall. This server is for applications and currently WebWAVES is the sole occupant. There is a hole in the firewall to the applications server.

The WAVES database now contains more than 238,000 records, representing the holdings of the COFOL member libraries. The majority of these records describe print materials. COFOL is in the process of developing cataloguing standards to describe electronic materials. Links from WAVES records to the full text of Departmental electronic publications will be added to the database. Because of the existence of WAVES, the COFOL librarians are able to play a role in assisting the Department in defining its standards for electronic reports available on Departmental Websites. The

librarians are encouraging the Department to make more reports available via the Internet. Traditionally, Departmental reports have been published in limited numbers in paper or microfiche, and within a few years of publication, many are out of print. Most reports are then available only through interlibrary loan from Departmental or depository libraries. The Department, by publishing electronic versions of the reports and making them accessible on the Internet will be assisting the libraries in their interlibrary loan activities since international users can be directed to a Website to obtain a copy of a report. COFOL libraries presently are gathering statistics to determine the impact of WebWAVES on library services.

The WAVES database began almost twenty years ago at the Halifax Fisheries Laboratory. Unlike the Laboratory, which was closed in October 1997 and the building demolished earlier this year, WAVES is not even close to destruction. WAVES is moving into the next century as a multi-featured union catalogue of Fisheries and Oceans Canada libraries and as a database of fisheries and marine science related literature.

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