

TELECOMMUNICATION AND INFORMATION SYSTEMS— A PRACTICAL APPROACH AND APPLICATION OF TELECOMMUNICATIONS TECHNOLOGY IN THE UTLAS INFORMATION SYSTEMS AND NETWORK[†]

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ABSTRACT

Recent advancement of telecommunications technology, coupled with the data processing development, has made a significant change in information systems and accessibility to the world's information resources from all corners of the world. Methods of communication have advanced from writing on bamboo or on clay tablets to packet-switched telecommunications network via satellite. On the other hand, however, languages and scripts such as Chinese, Japanese and Korean continue to express the distinctive and varied cultural heritages of the peoples.

This paper addresses some of the practical approaches and applications of a advanced telecommunications technology in the provision of bibliographic information systems in the world-wide network of Utlas International.

- * What is the function of telecommunication in a centralized network? How are centralized and local networks linked?
- * What is the role of telecommunication in the creation and maintenance of international resources of bibliographic databases? How are these resources accessed? What are the problems and how are they handled?
- * How are the character sets of Asian languages handled in the telecommunications processes? How can various national standards interface with international standards?

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What are the practical solutions?

- * How are multiple scripts such as Chinese, Japanese, Korean Hangul, together with Latin script, handled? What are the problems, and what are possible solutions?

These questions will be described with specific examples from the current practices of the UTLAS operations.

I. INTRODUCTION

Situated at the crossroads of Asia, the Republic of China is a unique representation of multi-faceted Asian cultures, languages and peoples. Because of such a background and tradition, it is quite feasible for ROC to play an important role now and in the future to foster international cooperation and sharing of resources among information specialists.

The topic of my paper is "Telecommunications and Information Systems: A Practical Approach and Application of Telecommunications Technology in the Utlas Information Systems and Network."

The recent advancement of telecommunications technology, coupled with the data processing developments, have made a significant change in information systems and accessibility to the world's information resources from all corners of the world. Methods of communication have advanced from writing on bamboo or clay tablets to packet-switched telecommunications networks via satellite. On the other hand, however, languages and scripts such as Chinese, Japanese and Korean continue to express the distinctive and varied cultural heritages of the peoples.

This paper addresses some of the practical approaches and application of advanced telecommunications technology in the provision of bibliographic information systems in the worldwide network of Utlas International.

- What is the function of telecommunication in a centralized network? How are centralized and local networks linked?
- What is the role of telecommunication in the creation and

maintenance of international resources of bibliographic databases? How are these resources accessed? What are the problems and how are they handled?

- How are the character sets of Asian languages handled in the telecommunications processes? How can various national standards interface with international standards? What are the practical solutions?
- How are multiple scripts such as Chinese, Japanese, Korean Hangul, together with Latin script, handled? What are the problems, and what are the possible solutions?

These questions will be described with specific examples from the current practices of the Utlas operations.

II. UTLAS

A. Corporate Overview

1. Introduction

Utlas International is a division of International Thomson Limited. It operates as a large computer service organization for libraries and information centres. It maintains a bilingual online bibliographic database which enables it to offer computer-based systems, services, and products in both English and French. The database consists of files from member libraries as well as those from several national libraries, including the National Library of Canada, the Library of Congress, and the British Library. The computerized cataloguing function provides customers access to an international library database with recent software developments providing interlibrary loan services, electronic book-ordering and acquisition capabilities.

The Utlas network is the result of two decades of

research and development at the University of Toronto culminating in a database and system that are recognized as a world-class achievement in the field of library automation. Utlas' Catalogue Support System (CATSS), a sophisticated, centralized online system is accessible throughout the world, 24 hours per day.

Customers view the large Utlas database, presently containing over 30 million records, as an essential resource for efficiently carrying out several of their key operations. Not only is this "information pool" a rich and varied source of cataloguing and other data; it also enables users to obtain a wide variety of conventional library products at substantial savings over their manual counterparts, as well as new products made possible by the computer.

This constantly-expanding, highly-flexible database gives Utlas the future potential to be more than a traditional library support organization. It will become an "information provider" servicing markets well beyond libraries, such as supplying information on new books and periodicals and interlibrary information to consumers through the Telidon/Videotex technology or other new forms of information delivery.

2. Brief History

Utlas can trace its origins back to 1963, when the University of Toronto Library set out to explore the potential of the computer in library operations. From 1965 to 1967, the Library participated in a research project using computers to prepare and publish a catalogue in book form. During the same period, senior library staff took part in a pilot project of the Library of Congress to develop a standard format for creating machine-readable catalogue records.

In 1967, a separate Systems Department was established within the Library, and a dedicated computer facility was procured. Already under way was a massive project to convert most of the Library's catalogue to machine-readable form, an undertaking that was completed in 1975.

The Systems Department was charged with developing automated systems for the library community in general, and not solely for the University Library. This mandate was made easier by the reorganization of the Department, in 1971, into a separate administrative unit named Utlas. Two years later, in September 1973, the online Catalogue Support System (CATSS) was inaugurated; it remains at the heart of all of Utlas' systems.

With growth came significant changes in Utlas' organizational status. In 1977, it became an ancillary enterprise of the University, reporting to the Chief Librarian. Two years later, a reorganization took place whereby it began reporting to the Vice-President, Business Affairs, and received its own Board of Directors.

In 1983, Utlas was incorporated as a company under the laws of the Province of Ontario. This new status reflected the University's recognition that Utlas International had evolved from a small research project into a true commercial enterprise.

February, 1984, also saw the inauguration of Utlas' Interlibrary Loan Facility which allows users to locate holdings in thousands of libraries in North America and Japan.

On January 25, 1985, negotiations for the sale of Utlas International by the University of Toronto to International Thomson Limited were completed. As part of this transaction, the University has entered into a long-term agreement with Utlas, whereby Utlas will continue to be the exclusive provider of current cataloguing services as well as being given an opportunity to develop new cir-

circulation systems for the University's libraries.

On January 27, 1985, CATSS II was officially inaugurated. Maruzen Company, of Japan, became the first user to file a record on the new system at a special ceremony held simultaneously in Tokyo and Toronto.

In May, 1985, an agreement was signed giving Utlas International exclusive rights to DataPhase's T/Series 50 software (formerly called ALIS III). The T/Series 50 is a circulation control system based on Tandem computer hardware. Many DataPhase staff joined Utlas forming a component of the company's United States operation.

In June, 1985, Utlas integrated Carrollton Press REMARC into its product line. REMARC is a large database of over five million records representing Library of Congress cataloguing prior to 1971, and providing an economical retrospective conversion service. Many Carrollton Press staff joined Utlas and formed a portion of Utlas' United States operation.

In mid-1984, Utlas began development of vernacular processing using Asian scripts. The first phase of the Asian Languages Processing Development was completed in April, 1986, primarily for Japanese libraries. Japan's CATSS prototype is described in more detail later in this paper.

3. Utlas User Libraries

At present, Utlas has a wide range of mature cataloguing products and a customer base made up of libraries of all types and sizes. More than 70 percent of the research and university libraries in Canada, including most of the major universities, belong to the user network. Over 475 institutions, members of consortia and government agencies representing 2,000 libraries in Canada, the U.S. and Japan, maintain user-owned databases through Utlas'

facilities: Academic libraries = 31%; special libraries = 38%; public libraries = 7%; library schools = 7%; commercial customers, such as book suppliers, = 7%; national libraries = 1%; and school boards = 3%.

Presently, twenty Japanese libraries have contracts to use the Utlas system, while others are using it in test mode. The communications link between Japan and Canada is provided through the packet-switched VENUS-P network, which allows Utlas' Japanese customers online access to Toronto on a pay-as-you-go basis. Later this year, dedicated circuits through submarine cabling between Japan and Toronto will be established reducing per-title telecommunication charges.

4. Present and Future

For the first seven years of its existence, Utlas concentrated on enhancing the online Catalogue Support System (CATSS) because the building of a database is the key to providing other library automation services. In 1980, work began on the development of an acquisitions subsystem of CATSS known as ACCORD (Acquisitions par CATSS/CATSS Ordering).

In the area of microcomputer-based library services, Utlas has signed an agreement with Innovative Interfaces, Inc. of Berkeley, California, to market a microcomputer-based system known as INNOVACQ to perform fund accounting and management report generation at the local library level. INNOVACQ is a very powerful and flexible system which interfaces with ACCORD and CATSS to give libraries complete control over the complicated procedure of acquiring materials.

The latest microcomputer-based product is M/Series 10, an online public access catalogue with a full reference structure including a circulation module. It has been

especially designed for smaller libraries and has the capability of handling file sizes of up to 25,000 records using a hard-disk storage device. A new micro-based product, ReQUEST, has been launched. ReQUEST is an economical, retrospective conversion product.

As noted in the company's history, on January 27, 1985, Utlas inaugurated its Tandem-based online CATSS II system--the culmination of a year-and-a-half long hardware and software conversion project that ranks as the largest and most ambitious undertaking in the Organization's history.

With the addition of the REMARC database and the T/Series 50 local system to Utlas' offerings, the range of services Utlas can provide is further enhanced.

Utlas is thus constantly moving closer to its goal of automating the whole spectrum of library services. Future application areas include additional online public access catalogues, information retrieval, and office automation.

B. Systems Overview

1. The Databases

Central to Utlas' activities is the CATSS II database of machine-readable (MARC) records. At the present time the database consists of 30 million records, including bibliographic, authority and book ordering information files.

The majority of records in the CATSS II database, approximately 90%, are bibliographic records describing monographs, serials, maps, music, audio-visual materials and machine-readable data files located in libraries worldwide. These records represent the cataloguing of the Utlas network members (over 475 institutions) as well as those of national source agencies such as the Library of Con-

gress, the National Library of Canada and the British Library. The database, in addition to being a rich and unique source of cataloguing and other data, also enables system users to obtain a variety of library products, such as catalogue cards, microfiche and printed catalogues.

Utlas has recently integrated the REMARC database into its operations which consists of over five million MARC records representing Library of Congress cataloguing prior to 1971. For libraries wishing to retrospectively convert their catalogues to machine-readable form, the REMARC database represents an invaluable resource.

The CATSS II and REMARC databases together provide Utlas users with a single source for meeting their needs for both retrospective and current cataloguing data. With the databases as a core resource, Utlas offers a broad range of on-line services, off-line services and local systems.

2. Online Systems

CATSS II

Recently upgraded and expanded to operate on Tandem computing equipment, Utlas' Cataloguing Support System, CATSS II, includes all of the features offered to CATSS users over the past decade with added flexibility and enhancements. The following are just a few of the features available on CATSS II:

- Online access to all 30 million MARC records on the database.
- Customer-owned files shared amongst a network of over 475 institutions, allowing users to copy or create original records.
- Sophisticated searching capabilities including precise and browsable keys and Boolean operators.
- Individual account profiles.

○ Electronic mail system.

The CATSS II system also includes the following sub-systems:

Authority Control — The authorities facility enables users to create and maintain authorized forms of names, uniform titles, series and subject headings. Through a unique online authorities validation process, headings from a library's bibliographic records are automatically searched against existing machine-readable authority files. When an exact match is found the system creates a link between the bibliographic heading and the form in the authority record. Once the records are linked, global changes can easily be made.

REFCATSS II and Interlibrary Loan — The REF - CATSS II and Interlibrary Loan subsystems are directed toward public service and interlibrary loan personnel who want to search for, verify or locate items represented in the database. All records available on CATSS II are available for viewing on REFCATSS II. For display purposes the numeric MARC tags are replaced with familiar terms such as "auth", "title", "subj", etc.

A user who has located an item in another library may use the Interlibrary Loan facility to electronically transmit either an automatically formatted interlibrary loan request or a free form message to that library.

ACCORD — The ACCORD subsystem provides access to the database for pre-order searching and book ordering. As with cataloguing, users derive suitable records into their order files or create original order records. A special set of commands then allows the library to format purchase orders, which may be either transmitted electronically to vendors holding an ACCORD account, or printed out at the terminal and sent to any supplier the library wishes. As they are filled, the order records are upgraded to become full catalogue records.

LABELS – Utlas' online local labels printing facility enables libraries to print spine and book pocket/card labels as a direct by-product of the cataloguing process. As with other Utlas services, this facility provides complete flexibility and is adaptable to the needs of the individual library.

3. Local Systems

Utlas offers a number of solutions for those library functions best handled on local systems.

M/Series 10

M/Series 10 is a PC-based online public access catalogue (OPAC) with an optional circulation control module. Designed for collections of up to 25,000 bibliographic records, the OPAC module provides a broad range of retrieval functions, including see and see also references, multilingual displays, the generation of statistics on catalogue use, and local message edit control. The M/Series 10 circulation module features rapid and accurate circulation processing and full integration with the OPAC database and shared hardware storage.

T/Series 50

T/Series 50 is a Tandem-based local library system which offers medium and large libraries circulation control and public access. A flexible system with a large number of parameter-controlled options determined by the local library, the features of T/Series 50 include:

- Circulation control through the automatic interaction of patron and item files.
- Blocks, delinquencies, charge and discharge functions
- Automatic calculation of fines.
- Searching by author, bibliographic record number, ISBN/LCCN, title, item number, record number and

subject.

- Compilation and printing of notices, overdue, recalls, holds availability and various reports.
- Public access catalogue, supporting author, title and subject searching, keyword access and Boolean operators.

INNOVACQ

Innovacq is an automated library system designed and assembled by Innovative Interfaces Inc., Berkeley, California. It provides a range of functions including those necessary to order items, maintain order records, manage fund accounting and evaluate vendors. It is available on its own, or fully integrated with the Utlas ACCORD ordering system and the Utlas database. The system, based on a multiprocessor computer, includes an optional module for serials check-in, which features a comprehensive method of checking in new issues, claiming missing and late issues, routing issues and maintaining binding control.

4. Offline Services

Products

The CATSS II system generates a diversity of products standardized to suit the needs of all types of libraries. Utlas currently supports the full ALA character set, plus a large number of special characters and diacritics for printing in over 400 languages. Utlas uses a Xerox 9700 laser printer for the best print quality available in the market place.

Products available include:

- Catalogue cards produced on a daily or weekly basis, and available in sets or streams.

- A wide variety of printed catalogues and acquisitions lists.
- COM catalogues on microfiche and microfilm.
- Magnetic tape in standard MARC communications format.
- KWIC indexes.

Retrospective Conversion

Utlas offers a number of options for libraries undertaking the retrospective conversion of their catalogue into machine-readable records.

CATSSERVICES – This unit, located at Utlas' Toronto facilities, consists of specially trained operators working under the supervision of a trained cataloguer. Upon request, CATSSERVICES, working from shelf list cards provided by the library, will carry out catalogue conversion or database creation projects for large or small collections.

REQUEST – This Utlas software product allows users with an IBM PC to create brief machine readable records which Utlas can then match against its database of 30 million records. The result is the creation of a file of full MARC records. All local holdings information is retained. Any catalogue products available through CATSS II can also be obtained using this service.

REMARC – Using the REMARC system, libraries may obtain both LC MARC and REMARC records through a system of online matching. Libraries may submit either a machine-readable file of circulation or other abbreviated records to REMARC for matching, or key-in brief search keys on microcomputers loaned to the library for this purpose. In the latter case the library forwards the disks containing the search keys to REMARC for matching. Libraries are then provided with "hit" records on magnetic tape in MARC communications format.

III. TELECOMMUNICATIONS

Some of the principal functions and attributes of telecommunications technology in library applications can be illustrated in these diagrams (OH #11, 12 and 13).

- Linkage and Network

Terminal – CPU – Terminal/Printer

CPU – CPU

- Conversion
- Sharing
- Standards
- Economy
- Multiple Scripts

TELECOMMUNICATIONS WORK BETWEEN IBM 5550 & TANDEM

1. THOROUGH ANALYSIS AT CODE LEVEL OF IBM'S COMMUNICATION SOFTWARE FOR 5550 ("DCOM")
2. EXPERIMENTATION WITH DIFFERENT MODES OF DATA FLOW
3. ANALYSIS OF INTERACTION
 - 5550 & PUBLIC NETWORK
 - TANDEM & PUBLIC NETWORK
4. SETTING OF NETWORK PARAMETERS TO MAXIMIZE DATA FLOW EFFICIENCY
5. RELATIONSHIP BETWEEN TELECOMMUNICATIONS AND CHARACTER SET

WHAT DEFINES A UNIQUE SCRIPT?

- "Extended" Latin for Icelandic, Irish, etc.
- "Extended" Cyrillic for Bulgarian, Uigur, etc.

- “Extended” Arabic for Persian, Urdu, Arabic script languages in China, etc.
- Do Chinese, Japanese and Korean use the same script?
- Do the Chinese characters used in writing Chinese, Japanese and Korean form one script or three?
- Passage of time – evolving scripts – unique position of libraries and bibliographic data.
- What is a variant character in the universe of Chinese characters?
- Character substitution practices in China, Japan and Korea.

IV. UTLAS' APPROACH TO VERNACULAR PROCESSING

A. PHASE ONE: JAPAN CATSS

1. Beginnings

When it became apparent that the growing number of libraries in Japan using Western CATSS required special facilities for the processing of Japanese language library materials, Utlas was able to build on the extensive experience it had gained in offering bilingual English/French services since 1973.

A test version of Japan CATSS, called the Prototype, has been created by replicating the Western CATSS system, and by modifying this replicated copy to process Japanese data. The Prototype is being reviewed by Japanese libraries in Japan during the period June to August, 1986. The fully developed Japan CATSS system will reside on hardware located in Japan where it will be accessible by terminals using the usual telecommunications network.

2. Separate System Approach

In developing a separate Japanese system rather than

integrating the processing of Japanese into the existing Western CATSS system, Utlas is following the Asian and European tradition of separate catalogues for separate scripts. Besides the reason of conforming to the tradition of the users for whom the system was designed, the following additional factors were important:

- a) *Simpler* – the separate approach is simpler. Such an approach ensures maximum efficiency and best performance in the use of the computer resource and thus maximum cost effectiveness to the user;
- b) *Fewest Compromises* – in an integrated approach, it is inevitable that the processing of one script (e.g., Japanese) will suffer from having to use exactly the same software as is used for another script (e.g., Chinese).
- c) *Standards* – a separate system allows the use of national standards for the script concerned, character set, MARC format, keyboard layout, and so on.

3. CATSS Functions Operational in the Japan CATSS Prototype

- a) Data entry, display, and printing
- b) Data editing
- c) Building databases of new records by:
 - i) deriving existing cataloguing records into one's own file;
 - ii) creating original records
- d) Quality check on records being filed
- e) Retrieval using precise access keys:
 - ISBN, local control number, Japan National Bibliography Number
- f) Browsible indexing in Japanese:
 - author, title, series, subject
- g) One-line citation display to assist in efficient selection

from multiple hit lists

- h) Provision for recording local data:
call number, holdings, accession numbers, etc.
- i) Messages and Prompts in either Japanese or English
- j) Telecommunications access from remote terminals

4. Japan CATSS Prototype Functions that are changed from Western CATSS

a) Data entry, display, and printing

Data entry, of course, must be done on a Japanese terminal. The Prototype uses the IBM 5550 for this purpose. The 5550 uses the customary kana to kanji conversion method to support data input.

b) Indexing

The browsable indexes used in CATSS to retrieve data are a unique feature of the CATSS system and offer the user the possibility of browsing through headings for authors, titles, series, or subjects in order to find the sought-for heading or record.

The software that supports this function in Japanese is entirely new since Japanese filing bears no relation to filing in English.

5. Japanese Standards

Japan CATSS follows:

- a) the Japan/MARC format devised by the National Diet Library;
- b) the JIS (Japan International Standard) character set (C 6226-78), Levels I and II; and
- c) the JIS standard keyboard layout.

6. Other Scripts

It is Utlas' intention to continue the replication process creating other language CATSS systems for Korean, Chinese and so on.

7. Other Systems and Products

As a natural continuation of its CATSS development, Utlas will be providing multiscript processing in its other systems such as the T/Series 50 circulation system, as well as in its printed byproducts, cards, book catalogues, etc.

V. CONCLUSION

- Recognition and full utilization of technology
- Adherence to regional and national standards, and equally vigorous adherence to communicating regional and national standards to international agencies
- International cooperation for interfacing national standards
- [Recommendation]
Establishment of an international committee to coordinate and communicate national standards (development, changes, etc.) in Asian bibliographic information processing