Consiglio Nazionale delle Ricerche

ARCA **assessment report**
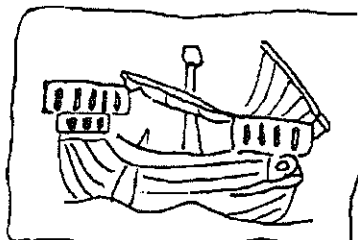
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ARCA

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1.0	New document	26 May 1997	First draft including Regione Toscana and University of Pisa Assessment
2.0	Includes results of assessment in Spain	22 July 1997	Data has become available from Spain assessment in the meantime.

Table of Contents

1.   Introduction

In order to make the ARCA assessment report accessible to a wider audience, we summarize the goals and consortium structure of the ARCA project in an introductory section. (This is the general description that can be found also in each ARCA annual report.)

The principal aim of the ARCA project is to enhance current practice and support technologies for the development of library networks which comprise heterogeneous library systems. With the advent of the Z39.50 protocol and its ISO-standard counterpart SR, an opportunity has arisen to connect Online Public Access Catalogue (OPAC) systems all over the world with each other. However, this opportunity has brought with it the problem of the interaction between professional librarians and a bewildering array of OPAC user interfaces, each with its own peculiar approach and philosophy. With this in mind, the main objectives of ARCA are:

•   to implement SR target functions by a software tool of general application that allows any existing OPAC to become, with a minimum effort, a target system with respect to the SR protocol;

•   to define and prototype a client application that incorporates the latest visual technologies and keeps pace with the rapid evolution in this sector

In keeping with this set of objectives, the ARCA project has consisted of three essential threads: *target, client,* and *attribute set handling.*

Z39.50 Target Kernel. Although originally specified only for ISO SR, the ARCA target kernel was ultimately developed for Z39.50 Version 3, implementing the core services (e.g. Present, Search), and then EXPLAIN. It was originally developed for Sun Unix, and is functionally independent of the underlying OPAC.

ARCA Dictionary. The dictionary is the unique aspect of ARCA. It stores the information needed by the target kernel to configure the underlying OPAC. The design and construction of the dictionary launched a major new line of librarian investigation within ARCA (see the attribute set handling discussion below).

Applications Programming Interface. The API is the minimal set of functions that must be provided by and to the underlying OPAC. A basic API was developed for experimentation with SABINI and for CDS/ISIS.

ARCA Client. Provision was made in ARCA for the demonstration of modern graphical user interface technology with the TCL/Tk toolkit in the development of a proof-of-concept Z39.50 client on the Unix system. The client work was expanded considerably to include support for Explain, and some multilingual considerations. (The client is configurable for interface language). A port to the Windows95 platform was made.

Attribute Set Handling. With the introduction of the dictionary concept for target-OPAC configuration, the ARCA librarians found it necessary to open up an entirely new line of investigation into the problem of attribute set and query mapping ambiguities (clearly essential for interoperability). This line of investigation led to several originally unplanned reports that culminated in great interest in the European libraries community.

Three technological partners are cooperating to carry out the objectives of the ARCA project:

- Intecs Sistemi (Italy). Intecs Sistemi is the coordinator of the ARCA project. It is a middle-sized high-technology software company located in Pisa, which has dedicated much of its resources in recent years to the information retrieval and multimedia market sectors. Aside from general coordination activities, Intecs is wholly responsible for client development activities in the ARCA project. In addition, Intecs has lent considerable support to the target implementation team, providing both personnel and consultancy activities where appropriate.

- CNR (Italy). CNR is the national research centre of Italy. The Pisa site is involved in the ARCA project—more precisely, two different institutes are involved, each with a well-defined role in the project. CNUCE is the technical lead in ARCA, responsible for Z39.50 target implementation technology. The Istituto di Elaborazione della Informazione (IEI) is the lead for all library science issues in the ARCA project, overseeing in particular all work in attribute set and query mapping work.

- SABINI (Spain). SABINI Automatizatión de Bibliotecas is the company which has developed the library handling software of the same name. It is the most widely used software for libraries in Spain with over 200 installations (University Libraries, Specialised Libraries, Public Libraries, Company Libraries, etc.). SABINI's role in ARCA is to act as a testbed for the integration of the ARCA target kernel with a commercial OPAC.

Another principal goal of the ARCA project is to involve the professional librarians and institutions of Southern European countries in the ongoing work and discussion surrounding the implementation of SR protocol services. Italy and Spain are particularly rich in their cultural and literary heritage, and have a great need for and interest in services for the interconnection of their vast library resources. The ARCA project involves not only technologists, but also professional librarians from a representative cross-section of the many types of library institutions in Italy and Spain. Three major end-users from these countries are involved in ARCA:

- *the Library Service of the Region of Tuscany (Italy).* The Library Service is part of the Department of Culture and Education of the Regional Government of Tuscany. By statute it is the authority competent for the preservation of the book and archival patrimony of Tuscany. It operates a bibliographic documentation centre and a library specialised in library and information science. The Service has organised a network of over 150 participating organisations including municipal libraries, cultural institutions, university institutes and research centres and operates on-line catalogues containing over 1,300,000 records concerning documentary materials (books, manuscripts, archives, prints, descriptions of documentary collections and descriptions of documentary institutes).

- *the Centre for Library Automation of the University of Pisa (Italy).* The Center is responsible of the automation of the library system of University of Pisa. The library system of Pisa University consists of more than 100 small and middle-sized libraries, 1 million books and 8000 current serials. For several years the most important of these libraries have been automated with different systems and different data bases. In particular, the central library of the Economic Science Departments and the library of the Political Science Departments are cooperatively managed through the ATLAS system. At the present time the Center is working on a project which provides the increment of mutual communication, the concentration of libraries and the coordination of the services; moreover the linking of the University ATLAS OPAC with the ATLAS OPAC of the Library and Documentation Center of the local Public Authority (*Provincia di Pisa*) is in progress. Numerous libraries of the university use UNIBIBLIO — 10 in a single-user DOS version, 5 in a multi-user Unix version. Two libraries use ERASMO, and are projected to use in an integration with the Pisa node of the National Library

Service (*Servizio Bibliotecario Nazionale*—SBN). Around ten libraries use CDS-ISIS.

- *the Sancho El Sabio Foundation (Spain).* The Library of the Sancho El Sabio Foundation was established thirty years ago with the aim of compiling all the documentation referring to the Basque cultural environment. In this time it has managed to build up a collection consisting of: 40,000 monographs (with established 12% from antique collections); 3,000 publication titles arranged in series; Various special collections (manuscripts, photographs, leaflets, poster, maps). The lack of existence of a centre of a public nature (National Libraries), the geographical division (Basque Autonomous Community and Navarra Statutory Community in Spain and the French Basque Country in France) and the linguistic diversity (Basque, Spanish and French) have led to Basque documentary collections being scattered in a multitude of centres. As a private centre, the Sancho El Sabio Foundation has overcome geographical and linguistic barriers to become over its long history the obligatory reference centre for Basque bibliography.

2.   Review of ARCA Target and Client Requirements

2.1.   Target Requirements

The requirements for the ARCA Target are specified in the ARCA Report T11/SRD. At the time that document was written, many important events in the Z39.50 world either had not yet happened, or were only beginning to happen. As two specific examples:

- Z39.50 and SR were only then beginning to merge. Finally, Z39.50 superseded SR entirely in its Version 3. The ARCA target team was forced to make several decisions about how closely to track the evolution of the protocol;

- EXPLAIN was in its infancy, and the target team had to come quickly to a decision about whether to undertake its implementation, and if so, to what extent, especially given the existence of the ARCA target architectural mechanism called the *dictionary*.

In this section we extract from the original requirements document those requirements which we felt were the most critical to be assessed by our users at a distance of two years from their original definition. These are the requirements that ultimately determined the unique architecture and character of the ARCA target.

a)   The ARCA SR Target implementation shall be independent of any particular client implementation or any information outside the SR protocol.

b)   It shall also be independent of any OPAC, and will be applicable to any OPAC provided that the OPAC runs on a UNIX machine, conforms to the model of remote databases specified at 6.2.1. of ISO 10162 and provides the necessary API.

c)   The ARCA Target will be conformed to the underlying OPAC by way of a loading function which stores appropriately information which characterize the functionalities that the underlying OPAC offers to process SR requests. The loading of the data descriptive of the OPAC should be managed by a program with a friendly interface system librarians.

d)   It will accept support the following services: INITIALIZE, SEARCH, PRESENT, and DELETE-RESULT-SET. Implementation of the EXPLAIN Service should be considered, as defined in the ANSI Z39.50 Protocol.

e)   As for the syntax and the composition of the records to be transferred from the OPACs, the ARCA Target System shall be able to give values to the parameters to the Present-Response APDU according to the characteristics of any underlying OPAC. However, the UNIMARC record syntax is considered to be the general case.

The State of the Target Today

From those requirements written in that original form, evolved the architecture and functionality of the ARCA target today.

- It is a Z39.50 V3 Target that supports the INIT, SEARCH, PRESENT, DELETE and CLOSE services and the EXPLAIN facility;

- It accepts any request for Z39.50 V3 services, sending back diagnostic messages for unsupported services;

- It accepts all Z39.50 V3 queries but supports only type 0-1-2-101 queries;

- It returns MARC, SUTRS, and EXPLAIN records (the Target on ISIS OPACs return UNIMARC records, and those on SABINI OPACs return US MARC record);

- The EXPLAIN facility supports the following categories: TargetInfo, DatabaseInfo, RecordSyntaxInfo, AttributeSetInfo, TermListInfo, AttributeDetails, ElementSetDetails;

- The ARCA Explain facility also allows retrieving EXPLAIN records in SUTRS format, so that any Z39.50 client can search the EXPLAIN Database even in cases when the client does not support the EXPLAIN record syntax;

- A separate, complete and user-friendly target interface configuration program allows configuration according to the characteristics of the underlying OPAC;

- The target has now been ported to several Unix variants, including Sun, Digital, and Hewlett-Packard.

As can be seen from this list, the architecture and functionality of today's ARCA target more than fulfills the requirements set out at the beginning of the project.

2.2. Client Requirements

For the ARCA client assessment we felt it would be useful to return to the requirements document for the client, written nearly two years ago, to compare what was written then to what was eventually implemented, as

- the Z39.50 protocol evolved;

- the needs of our users evolved;

- our own understanding of Z39.50 and the issues evolved.

The result has been extremely interesting for us. We are pleased to see that, by and large, we met the ambitious goals we set for ourselves in that requirements document, and in some cases even exceed them. (Our advanced implementation of EXPLAIN in the client is one such example). There were several requirements related to the "Virtual Library" that remain open for ARCA, but indeed remain open for the entire Z39.50 community today: these are related to cutting-edge topics such as digital images, inter-library loan, full internationalisation, etc. Even then, two years ago, we perceived that we probably wouldn't be able to undertake more than a preliminary investigation of these broad issues, and indeed we find ourselves today searching with the rest of the Z39.50 community for adequate solutions. Clearly, some of these issues will be addressed in future evolutions of the system.

Two interesting phenomena occurred as design and implementation evolved:

- There were requirements listed that simply never materialized as real issues. That is, the users *thought* they would be important, but as an understanding of the Z39.50 context was acquired, they realized that either the requirements were unnecessary, or they were covered by some other facility of the protocol or client. We indicate such cases in our detailed discussion below.

- Conversely, there were requirements *not* anticipated in the original document that emerged later in the project. As one specific example, we had severely

underestimated the necessity for client availability on a wide range of platforms, and this requirement was never even mentioned once in the original requirements document.

We present the original requirements for the client, extracted from the requirements document, together with comments below that summarise whether the requirements were implemented and discuss any issues surrounding them.

General Requirements

This section concerns requirements on the overall design of the system.

• The SR origin shall be able to access any SR target, and not be dependent on any particular target implementation or any information outside the SR protocol. (Out-of-protocol information *may* be used if available, but its use shall not be mandatory).

– *The ARCA client can access any target using either the SR or the Z39.50 protocol. It does not depend on any particular information outside the scope of the protocol.*

• It shall be possible to customize the operation of the UI according to the user's habits (e.g. having a file of most accessed databases).

– *Almost all of the settings are customizable by the user. These settings can affect Presentation, Querying, and session management. For example, a list of "most recently accessed servers" is provided that allows the user to connect easily to those servers.*

• It shall be possible to generate system-use statistics. This will allow for a technical-librarian set of procedures to determine user demand (such as access-point unification, etc.).

– *This has not been implemented, because our users have not yet required it in practice; however, it would not be difficult to supply.*

• The system shall be implemented in such a way that it is possible to prototype quickly different kinds of interfaces and interaction procedures. For example, a "toolkit" approach (using e.g. TCL), or "visual programming" could make this possible.

– *The system was in fact implemented using the Tcl/Tk toolkit for interface design and heavy use was made of the ability to prototype different versions of the interface as feedback was received from our librarians. This was one of the most successful aspects of the project, and much of that success is due also to the outstanding Ir/Tcl toolkit made available to us by Index Data of Denmark.*

Core SR Protocol Support Requirements

Session Initialization

• The system shall handle transparently all aspects of protocol initialization negotiation for the user.

- *Every effort was made to hide as much as possible from the user all the basic details of the protocol and let the user use the Z39.50 facilities in the easiest possible way. We believe we succeeded.*

- The system shall make it possible for the user to store and change user-determined parameters for protocol initialization (such as preferred message sizes).

– *The system does not require the normal user to input parameters other than target address and connection port. Expert users can indeed change the initialization parameters as described above.*

Composition and Manipulation of Queries

- The UI shall at least support the composition of RPN queries.

– *It is possible to formulate RPN, CCL and Private queries.*

- The system should, wherever possible, provide assistance in query formulation for queries which are available from the underlying OPAC system but are not strictly part of the RPN notation. In these cases, a mapping is provided into the RPN notation transparently by the UI. Examples (here from the SABINI system at Sancho El Sabio) are:

- *This requirement had its origins in specific systems within the project (i.e. SABINI) that support unusual mechanisms for querying. However, it was finally dropped in order to remain as much as possible compatible with the Z39.50 philosophy. At this stage such cases can be handled using the "Private" query type that let the users interact with the OPAC using the native OPAC querying language. In the end, we have not found it to be the problem that it appeared to be when we began work.*

    - Options such as *select, limit, combine*, etc. should be executable.

    - The relations *used* by, *see also*, and those defined in the OPAC's thesaurus (when supported) should be clearly displayable. Experience indicates that information is lost because people don't know how to use these relations. For example, when searching over "Yugoslavia," the *see also* relation yields "Croatia," "Serbia," etc.;

- *Again, this requirement had its origins in the existence of a thesaurus facility in SABINI. Note that an appendix in the client design document was devoted to this issue. But unfortunately, even today, the issue of thesauri in Z39.50 remains unresolved. There is no standard, no profile, no universal agreement on how to treat thesauri in Z39.50, and therefore we decided to wait.*

    - There should be the possibility of looking for more than one term in different fields within the same operation. For example, in searching for all the documents written by either Tellechea Idigoras or Múgica Zubiria and/or also with the term Guipuzcoa in the title and/or as a subject matter index entry;

- *Each term can be characterized according to the following aspects: truncation, structure, position end completeness. Logical combinations of such terms are also allowed.*

- It shall be possible to save RPN queries in files, for further use in other sessions.

– *This has not been implemented (not requested yet), but would not be difficult to provide.*

- Consultation of any previously executed search in a work session should be possible at all times by the user by means of a search list.

- *The client provides an easy mechanism to consult result sets resulting from previously executed queries. All the result sets found within a work session are consultable at any time.*

- The system should be able to support different attribute sets (at least the BIB-1 set, but it should be possible to extend it for others).

- *The system supports the attribute sets Bib-1 and Exp-1 (used in Explain queries). Its architecture leaves the door open to any attribute set (although this should be installed by expert personnel).*

- There shall be a language defined for the textual formulation of queries that can be translated into RPN queries. This may be called an SR "QIF" or "Query Interchange Format," the technique used in many contexts for an ASCII description language of data formats.

- *The UI uses a language to represent the queries but such a language is not transparent to the user. This issue will be taken into account in future work.*

- There shall be tools/mechanisms for composing queries from building blocks, using cut/paste, etc.

- Facilities for automatic and ergonomic assistance in composing queries, especially oriented toward beginners, should be provided.

- *The users is fully assisted in query creation. (This is one of the strongest features of the ARCA client.) User friendly windows and on-line help are available in this context. The user also is assisted through information obtained with the EXPLAIN facility.*

- Separate areas (e.g. windows) shall be provided for the visualization of structured queries.

- *Record visualization is fully customizable by the users. (This is another very strong point in the ARCA client.) Each record can be displayed in a separate (dedicated) window.*

Query Execution

- It shall be possible to request the status of a query search.

- *The ARCA client has a "status area" that always displays the execution status of operations.*

- It shall be possible to interrupt a query search if it is too long.

- *All operations can be interrupted at any time by the user.*

- It shall be possible to specify a maximum size of a result set to that the query is automatically interrupted if the result set is too large.

– *The Z39.50 protocol assigns this facility to the server. On the client side the user can determine the number of records to be transferred to the client. This avoids that the user must wait a long time when the result contains a large number of records.*

- For every search made, the number of records found shall be counted.

– *All the information pertaining to result sets is displayed. This information includes: Database from which the records are retrieved, number of records in the result set and number of records already retrieved by the client.*

Manipulation and Visualization of Result Sets

- It should be possible to have a reference screen display, sorted according to the user's interest—for example, by author, title, etc.

– *This has not been implemented—it was decided that another path (the current layout) was preferable.*

- The screen display shall have both a long and a short form (selectable). The short form could be a single line for each result record, whereby the long form would be a complete description of the record contents.

– *This is another strong point of the client. There are three forms provided as a default with the client. These are raw (all the fields of the record are displayed), medium (Title, Statement of responsibility, Edition statement, and Publications are displayed). line (only Title is displayed). Users can also create their own forms (Views) for record visualization.*

- It shall be possible to navigate among records in result sets easily with function keys (e.g. *next record, previous record, first record, last record*).

– *These features are accomplished using windows based mechanisms. The operations described above are achieved using point-and-click operations.*

- It shall be possible to print the result of a search and transfer it to diskette.

– *Both facilities are implemented. Printing can be done either on printer or on file and according to the desired visualization format. Record transfer is done keeping the original structure of the record (e.g. UNIMARC, USMARC etc.) allowing the use of transferred records by other applications.*

- It should be possible to display search references one by one or in previously user-established groups;

– *This never became an issue for our users in the end, and so it remains unimplemented.*

- It shall be possible to choose the reference final display format, using familiar terminology (e.g. the I.S.B.D. format).

- *The system lets the user change the display format at any time. It is also possible to create user customized display formats. So far, this has rarely happened, but we expect to see more of it as the client enters into long-term everyday use in the libraries.*

Character Set and Transfer Format Support

It is extremely important to support as many character sets as possible.

- The system shall provide for the intelligent normalization of special characters used by some OPACs, above all in linguistic environments that involve non-standard characters.

- *The system has been successfully tested in different countries, each one having its alphabetical peculiarities (e.g. Spanish character "ñ" "¿" "¡").*

- It shall be possible to export records in the MARC transfer format.

- *This is possible.*

- It shall be possible to export records in the bibliographic reference card format.

- *This is another example of a user-defined format. Such cases are supported by the customization facilities.*

General User Support Requirements

Network Access

The concept of a *search domain* shall be implemented in the client.

- There shall be user-friendly mechanisms for displaying possible databases to access and storing access addresses (e.g. Internet addresses) for these databases.

- *The search domain concept was fully implemented in the client, and has proven as successful with users as it promised to be. In particular, the implementation of EXPLAIN in the client proved to be crucial for the provision of this service. The available databases are automatically discovered by the client (through EXPLAIN) and are represented as a button in the interface. Thus choosing a database to search is a matter of pushing a button. The Internet address and port is entered in the client by means of a form and can be stored for future access.*

- It should be possible to store information locally on characteristics of SR targets (How this information is acquired—whether by EXPLAIN or other extra-protocol means— is outside the scope of this requirement).

- *The caching mechanism is used to optimize querying on the EXPLAIN database.*

Session Management

These requirements cover connection, session, and disconnection.

- The system shall have some kind of user identification on connection. This will permit information and recovery of sessions carried out over a period of time by a particular user.

– *The ARCA client supports authentication mechanisms as addressed by the Z39.50 protocol. Nevertheless session recovery involves a considerable amount of work done on the server side and should be done in such a way that it doesn't break the fundamental rules of the protocol, so it has not been implemented at this time. Nonetheless we see no fundamental obstacles.*

- There should be several user levels and privileges available.

– *This is another example of a requirement that has simply not yet become an issue. User privilege specification is turning out to be more of a server issue than a client issue.*

- It should be possible to have some kind of session history logging.

– *The most recently used servers are displayed in a special area ordered by time of last access. All the result sets created are listed (ordered by time) in a special menu.*

- There shall be some form of presentation of the current session status at all times.

- *The user is continuously provided with abundant information on the activities of the session. He is never in doubt of session status.*

- It shall be possible to establish a maximum session time limit, with a prior disconnection warning to the user.

– *This issue has been dropped because it appears to be a server issue. The client side doesn't care about spending a lot of time doing nothing, and it is the responsibility of the target side take care of resource expenditures as addressed by the standard (EXPLAIN has a field called max timeout interval for this purpose).*

- It shall be possible for the system to disconnect itself if there has been no user activity for a specified period of time.

– *Same as above*

Browsing Support

- For all words, the system shall provide the possibility of consultation and browsing of the dictionaries of terms present in the OPAC selected.

– *Browsing is supported but limited to the capabilities of the server. The users can send a browse request using any arbitrary access point. EXPLAIN information is not used in browsing.*

- It shall be possible to formulate queries during the archive browsing process.

- *This is a standard operating mode for the ARCA client.*

- Automatic spelling correction is desirable.

- *This has not been implemented, but is an ideal candidate for implementation when the emerging "component-oriented" software construction methodologies are more mature. Thus, a spelling correction "module" could be integrated quickly, adding that functionality.*

- It shall be possible to browse the headings (short forms) of retrieved records from a query.

- *This has not been implemented yet, (never requested) but could be a candidate for future work.*

General Presentation

- It shall be possible for the user to develop an appropriate conceptual model of the system (e.g., a paradigm of filling out forms).

- *The client strongly supports a forms "building block" paradigm, as seen in many systems today such as Microsoft Access.*

- The UI shall be constructed so that it can support more than one language. This also makes it easier to disseminate (or to sell as a product) in different countries.

- *The system is available in three languages: Italian, English, and Spanish. The amount of work to be done to add another language is the amount of work needed to translate the messages. No appreciable extra work has to be done to enable the client to recognize another language (although we have not yet tried this on a large scale, and have some misgivings about what might happen with exotic languages.)*

- The UI should cover all the languages spoken in the EC, including minority languages such as the Basque language.

- *See answer above. In the end, Basque was not requested. But we repeat that exotic languages, including those from Eastern European countries, probably contain hidden problems that we have not yet fully appreciated.*

- System actions shall be made explicit to the user.

- *The user is always fully informed of system actions that concern him. Conversely, system actions that concern only the operation of the protocol are hidden from the user as much as possible.*

- Verbal labels shall be provided that are suggestive of their intended meaning.

- *We believe that this is true, and so far our user feedback has supported our belief.*

- The system shall accommodate different styles of interaction (mouse-based, selection from menus, typing).

– Almost all operations can be carried out using one of the following methods: menus or buttons. For some operations also a fast keyboard "accelerator" mechanism (e.g. Alt-<key>) is provided.

Help Facilities

• Context-sensitive help facilities should be provided.

– *This has become another strong point of the ARCA client. The ARCA client uses (in the Windows95 version) the Windows95 native help system to provide help. Thus all the features available in Windows95 help are available (keyword searching, topic searching, printing, etc.)*

• There should be an online manual which can be printed out.

– *A user manual is available online, and can be printed for a paper-based version.*

• It shall be possible to print an individual help function text.

– *Each individual help topic can be easily printed.*

* There should be an online tutorial.

- *The online user manual has been written in an expository tutorial style, and has been well received by the assessment personnel in that form.*

Services Oriented Toward the Virtual Library

• The system should allow for book-borrowing procedures—or for book reservation, if the book is not available.

– *Although this requirement is understandable, has been dropped because is outside the scope of the Z39.50 protocol and the ARCA project. To achieve this the ILL protocol should be taken in account and, given the ability of the Z39.50 protocol to host the ILL protocol, the provision of support for ILL could be considered in further evolution of the client. Such activities are perfectly in line with the Commission's intentions for integration of services in the library infrastructure.*

• There should be the possibility of offering online suggestions.

- *The issues below involves communication with other protocols (mainly SMTP for mail and WWW for integration) and were outside the scope of Z39.50. All of these issues should be taken in account in the integration of the client with other applications, and we hope to address them in future projects.*

• There should be the possibility of sending messages to library personnel.

• Interactive dialogue between users and library personnel should also be possible.

• Automatic register integration from one library to another should be possible.

• The user should be able to fill in opinion surveys previously established by the library through this system.

- *Clearly, the above four requirements were of a global nature, intended for specific installations (those of our users) and not really directed at the client itself, at least with regard to its support for Z39.50 activities. We expect requirements like these to be addressed in future large-scale installations of ARCA (e.g. "the Italian national library network") in an organisation-specific manner, not generalisable to other installations and organisations.*

* The system should allow for several kinds of information:

    * Library Information

        - General information

        - Service information offered

        - Information on the various consultation services available.

    * Information on other centres available to the system.

    * Information on centres which may or may not be connected to the system but which have similar bibliographic characteristics and resources.

- *All the information above are acquired through the EXPLAIN facility. The client does not yet exploit all of the facilities of EXPLAIN (partly because servers also do not yet support all facilities).*

Intelligent User Assistance Requirements

The requirements in this section are very advanced and refer to the kind of assistance that approaches that of a reference librarian. It is not expected that all of these requirements will be implemented in the ARCA SR Origin prototype.

* Assistance should be provided to the information seeker so that he can map his knowledge of a topic onto the system.

– *This was one of the "futuristic" requirements on a virtual library, and we made little progress here, although please note the assistance given by EXPLAIN in this regard. The client configures itself according to the information in the EXPLAIN database and shows to the user that information which is intended for the end users.*

* The system should actively help the user explore topic areas.

- *This was a clear "futuristic, virtual library" requirement that we were unable to address during ARCA.*

* It should be possible to consult digital images of the obtained references.

- *As we well know, digital image handling in Z39.50 is now being addressed on many fronts, including new profiles. Although we could not address it during ARCA, we have every hope of addressing it in the future.*

3.   Description of Assessment Sites

3.1.   Assessment Sites in Italy

The Target is currently running on several different platforms; the assessment has been conducted on the following sites:

- ISIS-OPAC of the Pisa University, running on SUN Solaris 2.5; databases: CDS (administrative papers), ANGLO (Books of Anglistics), TEACH.LANG (Catalogs of the Center for Teaching Foreign Languages)

- ISIS-OPAC at the IEI running on SUN Solaris 2.5; database: IEI.BOOKS (Books of Informatics)

- ISIS-OPAC of the Regione Toscana, running on HP 9100/816 with UX 10.10 operating system; database: TECA (Union catalogue of the Libraries of Tuscany Region)

The ISIS system is a "classical" IR system, upon which databases with different access points and different access routines can be constructed; indeed, the three ISIS OPACs are not equal, event though the differences are slight and reside only in the access points and related mapping of BIB-1.

The ARCA Target has been successfully applied to each of the OPACs and individually conformed by inputting information related to each of them with the use of the Target Interface, as described in the Target Interface Manual, ARCA report ARCA/T141/TIM ("Target Interface Manual"), May 1997.

The interoperability with the ARCA client and with the client independently implemented by the ICCU-Istituto Centrale per il catalogo Unico (Roma) has been tested. (Thanks are due to Claudia Parmeggiani of ICCU and Luca Lelli of TECSIEL.)

Points a)-c) of the ARCA Target Requirements as listed in the Requirements section of this document have thus been successfully assessed. Points e)-d) will be treated in a later section.

3.2.   Assessment Sites in Spain

During the assessment made in Spain, users had worked with the ARCA client against ARCA servers and non-ARCA servers and they had also worked with other Z39.50 clients against ARCA servers, so while describing the assessment scenarios all these possibilities must be considered.

OPAC Interface

Although several ARCA servers had been tested from the final users point of view, the assessment had been basically concentrated on ARCA servers installed in Spain. All of them use the SABINI system in order to manage their libraries, so the OPAC with which the ARCA target had been assessed had also been the SABINI OPAC.

Due to this fact some considerations must been made on the SABINI OPAC which will allow the reader to understand some of the answers and comments received from the final users:

- the SABINI OPAC can be set up by each library. Specially each library can set up different OPACs and each of its access points. Then the different OPACs used during the assessment were not equal.

However, the ARCA SABINI Interface had been designed and developed allowing the server to answer any query accepted by the Z39.50 standard which the SABINI system is able to manage, independently of the different library OPACs available. While settting up the dictionary, each library can define the options which it would like to offer to its users among all those the ARCA SABINI interface allows him.

Due to this fact, some of the final users that had collaborated in the assessment had found out that while accessing their own data bases, but using the client instead of the OPAC, the available functionality was greater or lesser depending on the setup decided for each of them. The comments this situation had provoked are not significant to evaluate the products. To balance this situation, different setups were offered to those final users in order to avoid falsifying the final conclusions.

- the SABINI OPAC offers the user some tools and functionalities which the Z39.50 standard doesn't still support, as its navigation through the hierarchiies of a Thesaurus or multilinguality (the user can choose the language of the terms while searching and accessing the stated information).

The end users accustomed to these facilities bear them too much in mind while evaluating the ARCA target and client. This fact led them to reject some of the initial comments marked on the questionnaires. After clarifying the situation (and promising that the standard will continue its evolution and will support those facilities in the near future), comments and evaluations were obtained from those users that were useful for the final conclusions.

ARCA target

In order to carry out this assessment, the target had been installed in different sites and platforms:

- The Fundación Sancho el Sabio (FSS) at Vitoria-Gasteiz with an IBM AIX 3.2 server which manages a data base organized in 2 catalogues: libros with some 85.000 records and revistas with some 5.500, both of them concerning basque culture.

Regrettably this server can only be accessed through the local network due to some changes that presently are taking place in its communications infrastructure.

- Ibermática at San Sebastián with a SUN SOLARIS 2.5 server which manages a data base organized in 2 catalogues: libros with some 5.000 records and revistas with some 1.500.

This data base is a selected subset from the Fundación Sancho el Sabio data base. This installation was made in order to facilitate the rest of the final users a remote access to this information taking into account the problems with the infrastructure changes mentioned in the above installation.

- SABINI Automatización de Bibliotecas (SAB) at Madrid with a DIGITAL OSF 3.2 server which manages a data base organized in 6 catalogues: biblioma with some 30.000 records, legislación with some 5.000, revistas with some 1.000, proyectos with some 1.000, vídeos with some 900 and estudios with some 600, all of them related to information concerning the environement.

This server is not usually accessible from the outside, it's only used as local server, specially because the data base is property of the Environement Ministry which has

lent it to SABINI Automatización de Bibliotecas so the project assessment could be carried out with a data base of considerable scope, but it's the own Ministry who will offer it to the users in its own Z39.50 server when the project would be finished.

- Universidad Pública de Navarra (UPNA) at Pamplona with a DIGITAL OSF 3.2 server which manages a data base organized in 2 catalogues: libros with some 75.000 records and revistas with some 1.800, both of them with information concerning all the high studies that can be attended at this University.

This server is fully local and remote accessible, even though no dissemination had been made about its Z39.50 server address waiting for the end of the project. It has only been employed as assessment platform.

- Universidad de Huelva (UH) at Huelva with a DIGITAL OSF 3.2 server which manages a data base organized in 2 main catalogues (others has just been initiated): libros with some 20.000 records and revistas with some 500, both of them with information concerning all the high studies that can be attended at this University.

As in the above situation, even though the server is fully local and remotely accessible, no dissemination had been made about its Z39.50 server address, it has just been employed as an assessment platform.

ARCA client

The client had always been installed on Windows 95 PC Pentium 100 platforms with generally 16 Mb. RAM.

It was decided not to do too many installations of the client during the assessment in order to be able to do a real supervision over the users' answers. Attending this purpose, the client was just installed at the Fundación Sancho el Sabio and SABINI Automatización de Bibliotecas, even though a considerable number of final users visited these sites in order to collaborate there with the assessment.

In the near future, in trying to extend this evaluation results, there will be a wider dissemination of the client, but taking into account the short assessment period available, the described situation was adopted because it allows us sto observe each of the users reactions, offer them any complementary explanation needed to understand the real significance of each of their comments and answers to the questionnaire.

4.   Descriptions of Individual Assessment Procedures

4.1.   Assessment by Librarians of Pisa University and IEI

Librarians of Pisa University and IEI have been organized into two groups:

Group A (five librarians): Librarians acquainted with BIB-1 mapping and modern graphical user interfaces (GUIs), and who had participated in Phase 1 of the ARCA Project.

Early on, the librarians of Group A were given a copy of the ARCA client (*but not the client manual*) which already contained the addresses of various Z39.50 Targets and two basic templates for creating queries. This first step had the aim to test how the client could be intuitively used to perform the primary functions of connecting, searching and retrieving.

As a second step, the librarians were given the client user manual, in order to allow them to assess all the functionalities of the client.

Group B (two librarians): Librarians not experienced at all with Z39.50.

The purpose of assessing the client by inexperienced librarians has been to know how such librarians react when searching with the protocol.

Description of the Work

Group A began to work in the middle of March. Librarians learned rapidly the basic functions of connecting a Target, selecting one of the predefined query templates, formulating the query and retrieving the results. These basic functions were judged to be easily performable, and in a intuitive way.

Thereafter, they were provided with the first version of the client manual and requested to assess the readability of the manual and all the functionalities of the client versus the ARCA targets installed at IEI and, soon afterwards, at Pisa University .

During this first phase, attention was mainly given to test the correctness of the client and target functionalities. The work was carried out in close communication with the technical staff, both for requesting clarifications and for communicating any discovered errors. Indeed several minor errors were discovered, both in client and server, and this caused new versions of the Target to be transferred to the IEI test site, and new versions of the client to be transferred to the test site at IEI (Unix version) and to the two test sites (Windows 95) installed at Pisa University. For this, an FTP site was established first at Intecs and then at CNUCE, from which the new versions of the client could be downloaded by librarians themselves. In those occasions, librarians appreciated the auto-installation function of the client.

However, librarians used the greatest portion of their time to get acquainted with functionalities they had never experienced in their daily work—in particular all the functionalities addressing the setting up of query templates and the management of UNIMARC records, even though they know them theoretically.

Note: In this phase it was discovered that the ISIS system crashes when searching with truncated terms shorter than three characters. This malfunction, that only depends on the underlying ISIS system, still remains and has been communicated to the Staff of the

Italian Maintenance Agency, DBA, so that it will be transmitted to the UNESCO ISIS Staff.

After assessing that Target and Client function correctly, two new databases were added to the target at Pisa University, and the ARCA client was mainly considered as a tool for library work, and therefore assessed from the point of view of library staff and "end users" (i.e., librarians of group B).

Participants in the Pisa Assessment

Librarians of Pisa University:

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Discussion has been coordinated and reported by M.B. Baldacci.

4.2.   Assessment by Librarians of Regione Toscana

The assessment for the Region of Tuscany was managed by two high-level functionaries in key positions in the Region. Dr. Giovanni Bergamin is a leading member of the Technical Staff at the prestigious Central National Library in Florence. He has significant experience with OPAC cataloguing software and the Z39.50 standard. Dr. GianLuigi Betti is an expert in librarianship in his position with the Region of Tuscany.

The ARCA client was installed on Windows95 machines both in the Region of Tuscany and in the Central National Library in Florence. Unfortunately, the ARCA client needs preferably a Pentium processor on Windows95 for good performance, whereby within the Region and the National Library there is still a vast inventory of computers with Intel 486 processors. This placed discernible limits on the response times of the client.

The assessment personnel carried out comparative searches in the data that was available on the server of the Region of Tuscany, as well as the data on the server at IEI in Pisa. In both cases, the search activities went well, without significant technical difficulties.

All functionalities of connection, search, and visualisation of the data in different formats were checked and verified.

In addition, the user interface was examined from the point of view of the end user.

4.3. Assessment by Sancho el Sabio

In order to well describe and understand the assessment carried out by the Fundación Sancho el Sabio and SABINI Automatización de Bibliotecas, the assessment personnel must be distributed in three different groups: computer-technical personnel, library-technical personnel and end users.

In all the three groups there had participated persons with more and less experience on communications, systems interconnection and Z39.50 standard looking for both an evaluation on the expert use of the offered functionalities, as well as the first impression and the better way of correcting the first impression if it was merely the result of inexperience.

Computer-technical personnel

This group of persons has been in charge of testing and evaluating aspects as the target installation on different equipments and platforms, setting up the dictionary on different servers, modifying these settings, and so on.

Additionally, they have exhaustively tested the target behaviour at SABINI servers and the SABINI interface. They found out some errors which were modified or notified to the target development team in order to be corrected.

Thanks to the fact that also less experienced personnel collaborated in the assessment, it was revealed that in a completely new installation made since the very begining, more problems than the initially expected usually occur and, due to the final result complexity, it's not always easy to detect which piece in the machinery is working defectively. Once finished an installation that seems to be correct, the user gets some errors while using the client against the server, and is very hard to find out exactly where the mistake was really made.

Library-technical personnel

Possibly this group of persons was the key to the success of the assessment carried out in Spain.

We were fortunate to have a sufficiently large group of librarians that were expert on difficult aspects such as MARC format, BIB-1 mapping, systems interconnection, knowledge of the real needs of libraries' final users, putting new tools and functionalities at those final users' disposal, final users training in its use, and so forth. In fact, they had been selected even in a way that both librarians devoted to users advice and librarians devoted to different libraries advice were included in the group.

This special selection criterion allowed us not to be too concentrated on a specific library case, but to evaluate the project result and its application to different environments, selecting in each case the dictionary and client set up more conveniently and the way of training and motivating the final user.

Additionally this group of professionals became a wonderful assessment bank for a complete system revision, detecting several little errors or aspects easily to improve in the system and opening a spectrum of possibilities to be considered in future developments.

These librarians had worked setting up the dictionaries for each server depending on the available information, its users and the access to this information the users are accustomed to, as well as the one needed for other kind of users less familiar wtih each server. Naturally, they also tested the available tools for this purpose inside the ARCA project, such as the sophisticated ARCA Target Configuration Intetface.

On the other hand, they had much work to do in setting up different clients, not only to completely test its functionality, as it has already been mentioned, but also to obtain the customised configurations appropriate for each kind of final user: diferent query templates, diferent views, and so on.

It must be mentioned that these librarians had also devoted a significant amount of time to study and analyze the ARCA client against non-SABINI and non-ARCA servers, and non-ARCA clients against SABINI servers. This fact had allowed them not only to complete the evaluation and correct client operation, but also to well know and understand what a user non familiar with the server expects to find and the principal doubts and problems he usually had. This information has been of a great value to foresee the behaviour of the same final users that afterwards have evaluated the client and collaborated to optimise the client and servers configurations.

End users

It is an heterogenous group of libraians non experienced on Z39.50, neither on aspects related with this standard, and library users that regularly worked connected to diferent servers and knew different query systems (not necessarily using Z39.50).

This user group, that represent a high percentage of the final beneficiaries of the project, had evaluated (but only partially) the systema functionality (mainly the client) and the setup designed by the other librarian group.

Since the evaluations of these users were closely monitored, and their opinions and comments were immediately taken into consideration, they were also immediately used to improve the configurations currently used.

The conclusions obtained from these end users assessment are to some degree less significant for the project results evaluation due to the fact that they are too conditioned by their lack of training and information. However, it is still very interesting to see their spontaneity and the rapidity with which they communicate their first impressions.

There is no doubt that this kind of user represents an important segment of the population to which the development is addressed, and additionally they bring out very valuable information on how the final user manuals must be designed, how the system must be presented, how the training courses must be prepared, and many other aspects that fall outside the evaluation capacity of the previous groups, but are crucial to assure the correct working and future exploitation of the development carried out during the project evolution. That is, it will determine the repercussions the project could have for the world of libraries.

5.   Reports from the Assessment Personnel

5.1.   Librarians from the Pisa Assessment

The ARCA client is a very flexible one and very easily usable, also by inexperienced users, for the basic functions of connecting remote Target, searching, retrieving and downloading records into local files. Other functions, such as the basic settings for Target addresses, search templates and record views, can only be more reliably managed by experienced librarians, as will be discussed later.

The following capabilities have been much appreciated:

* Additional targets not in the menu can be added by only inputting the target's address and port;

* Searching multiple targets is allowed; different targets can be connected without exiting from the client;

* Browsing indexes and capturing terms directly into the query template;

* The comprehensive support offered by the client for editing user-entered information (such as target descriptions and, especially, query templates);

* Resources can easily be accessed and downloaded;

* The possibility to navigate among records in result sets easily with point and click operations on navigational icons;

* Various formats can be selected to visualize and print the retrieved records.

The above points cover functions that librarians already experienced by using other, non-Z39.50 systems. But librarians judged that the ARCA client allows to exploit them very efficiently and in a user-friendly fashion. This assertion corresponds to the very enthusiastic reactions that experienced librarians had when the ARCA client was first shown at the Congress of the AIB-Italian Library Association, in Trieste (November 1996).

More effort is necessary for learning and using other functions, especially those addressing i) the mapping of BIB-1 for setting query templates and ii) the manipulation of MARC records. It is difficult to say whether this extra effort depends on the way the client works, or is due to two specific factors, which are true also for most Italian librarians:

i)   using a system for mapping BIB-1 is a novelty, also for librarians experienced with BIB-1;

ii)   librarians know MARC records only theoretically, because in Italy MARC records are used only in very specialized sites.

Points i) and ii) merit further discussion.

Regarding point i), librarians experienced with BIB-1 mapping could easily (even though not "immediately") learn how to set up query templates. Furthermore, having

dealt with the problems of semantic interoperability, they very much appreciated the following characteristic:

- The client capability of conforming to the connected Target by exploiting the Target EXPLAIN facility.

In fact, when setting up a query template to search a given Target, the ARCA client allows to select only from those access points allowed by the remote OPAC and to associate with them only attribute combinations supported by that OPAC, thus giving complete solution to semantic interoperability problems. For that reason, the semantic interoperability between ARCA Target and Client, and between ARCA Client and Targets offering the EXPLAIN facility (for example, the AT&T Target) has been considered as completely satisfactory.

When the connected Target does not offer the EXPLAIN facility, experienced librarians can get information about the supported attribute combinations and Boolean operators from elsewhere. For example, see the "conformation guides" linkable from the list of "Z39.50 Hosts Available for Testing" at the following URL:

```
http://lcweb.loc.gov/z3950/agency/register/testport.html
```

Alternative solutions, on the other hand, must be envisaged for end users for whom the capability of exploiting the function of setting appropriate query templates is not thinkable as long as the BIB-1 mapping is not in widespread use. Examples of possible solutions are as follows.

1) To prepare a "standard" template according to the ATS-1 Profile and define it as a "default" choice (although the ATS-1 profile has well-known limitations and is not widely implemented);

2) To prepare query templates and associated combinations—one for each Target offered by the Target menu—and name them with the corresponding target names; thus the end user who wants to search a given Target can select the corresponding query template in the query menu.

This solution makes it possible to exploit all the individual search capabilities offered by each Target. However, it is not appropriate for distributed searching.

Regarding point ii), the same line of reasoning holds. Librarians have much appreciated the following characteristic:

- the simple solution adopted by the ARCA client to manage *any* record of the MARC family, thereby allowing result sets of records with different syntax to be correctly visualized.

Guided by the menu, any user can easily select one of the predefined formats for visualizing records, but only experienced librarians can create and/or edit new views or manipulate MARC tags appropriately .

Concluding the comments on points i) and ii), librarians think that the Z39.50 capabilities for client-target communication are presently very scarcely known, and allowing end users to exploit all of the client's capabilities might very well prove to be risky. Therefore they suggest that end users might be given a version of the client where:

- search templates are predefined by librarians;

- functions presently listed in the "Options" menu are limited to those functions where values can only to be selected, but not constructed nor edited.

5.2.   Librarians from the Region of Tuscany Assessment

We summarise most important comments from the assessment at the Region of Tuscany.

1)   Overall, the user interface appears to be not only adequate, but sufficiently user-friendly to be given to a general public without restrictions. This is an important conclusion given the potential for widespread distribution in local libraries in the Region, where there will be librarians without significant networked information retrieval experience. Nevertheless, it is envisioned that training opportunities be made available to Regional library personnel.

2)   The creation of query masks was judged to be very exhaustive and complete in its support for the available attributes. This was also a very critical point for the kinds of applications that arise within the context of work in the Region.

3)   The assessment personnel expressed particular appreciation for the facility for storing the results of searches on disk, in order to be able to use them later in other contexts. This is also a situation that arises very often in the complex library environment at the Region, with many interacting libraries that must exchange data among them.

4)   The assessment personnel expressed a desire for the realisation of a facility that would make it possible to transfer from one ARCA client to another a set of predefined queries. For example, this might take place by means of a suitable configuration file that permits a simple configuration of all of the clients distributed throughout the territory. Once again, note the context: the Region of Tuscany must serve a vast network of small, local libraries, as well as important large central libraries in the regional capital. Thus not only a "local" configuration of a client for a single user is desirable and necessary, purely for reasons of personal convenience and efficiency; but also the facility for a more "global" (that is, territory-wide) configuration ("customisation" or "tailoring") of the client for the entire installed base scattered throughout the Region.

The assessment by the Region of Tuscany brought out a fascinating and different perspective from that in Pisa: They live and work in a much broader, cooperative context in the Region of Tuscany, whereby far-flung offices, libraries, and archive centers over large geographical distances are communicating in a relatively coordinated manner. Thus the requests arriving from the assessment personnel in the Region were often at a higher, organisational level than those arriving from the Pisa assessment, which often regarded more precise technical issues related, for example, to the handling of Z39.50 attribute sets. Thus, at the Region, they would request a way to be able to control the configuration of all clients in the territory, and to be able to distribute updates in a timely and well-organised manner.

These are all issues that will have to be addressed in a subsequent phase of large-scale operation of the ARCA system (client and target) throughout the Region. Solutions to these issues will only partly have a technical nature—they will also have an organisational nature, and will depend on whether procurement and configuration of the client and target are centralised, or delegated to local libraries (or civil authorities in the Provinces). The issue of centralised versus distributed control will affect how the ARCA client and target are supplied to the Region and how their evolution is managed for the needs of the Region.

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5.3.   Librarians from Sancho el Sabio and SABINI

The assessment results presented next are based on the evaluation made by the librarians, both experienced and final users. To be more precise, it is based on their assessment on the behaviour of the ARCA client against SABINI servers or consulted together with other servers.

Thus the assessment results of tests and evaluations furnished by other groups or about others subjects have already be mentioned in the above sections of the report, at least the main ones.

While evaluating the results, it is important to take into account that it is very difficult to evaluate only concepts related to the client and its functioning against the target. Many of the users based their comments and opinions on concepts related to the Z39.50 standard itself, comparisons with their own OPAC, facilities offered by the client and missing ub their OPAC or the opposite, and so on.

General conclusions

The general conclusions that summarize the assessment results must be presented while considering to different user levels based on their knowledge of the Z39.50 standard and their connection frequence to other systems and libraries through Internet or any other procedure.

To the expert librarians, who know at least the Z39.50 standard meaning and requirements, who have worked with other Z39.50 clients and servers, who know MARC format and have a certain amount of experience setting up systems, the ARCA client seems to be very good. They have much appreciated and valued the possibility and facilility to define their own query templates and views, to define new servers and know their characteristics, to manage different format records comming from diferent servers, and so on.

From the librarians that don't know even the existence of the Z39.50 standard, but are used to connecting to different libraries through Web services or telnet sessions, the first comment usually heard was "that's not a new thing, I have done this for a long time". When they really understand the scope of the system and the possibility of using a single unique interface to access different servers even simultaneously, they feel so relieved of the effort this situation actually represents for them that they are no longer capable of finding additional objections to the system. Unfortunately this fact doesn't help the correct client evaluation, but confirms that the standard and the project are of clear benefit to the libraries world and answer a real need of these professionals.

Possiblly it would be necessary to make a greater dissemination among these librarians about the existence of the standard, the systems (clients and servers) that allow the users to employ it, different uses that they could made of it independently of the library in which the librarian is or the place in which he performs his professional work. It is very important that this group of librarians without the resources or the training which can be found in big institutions or specialised ones, could profit from this easy access to large volumes of information instead of investing considerable human resources in order to access just partially this information by searching from system to system.

Last, but not least, for the final users who are even not used to connecting to any remote server, nor to navigate through Internet from time to time, the access to different remote

servers in such an easy way with the client allows them seems to them to be "just magic", and it took them also a while to overcome their astonishment and be able to continue really evaluating the system. In any case this last user group exhibited a higher criticism capacity than the previous one, perhaps because they hadn't invested so much time and effort trying to get what now is easily offered to them.

Advantages and criticism summarised

Although the general conclusions were already presented in the above point, it is interesting to highlight some aspects of the client and the system in general (again, it is difficult to separate ARCA from Z39.50) according to the frequency with which they were mentioned.

The positive aspects that more librarians and final users highlighted are:

- availability of a unique interface, easy to use, to access different servers simultaneously and avoiding to learn different systems in each case.

- possibility to access the big libraries just pushing 2 or 3 buttons and the speed with which they answer.

- possibility to access a large volume of information with little effort.

- interconnection facility with other libraries

- availability of numerous access points and a great facility to combine them.

- possibility and facility to define its own query templates and views (experienced librarians).

- possibility and facility to carry out wide consultations and bring the results to the home PC in order to continue working with them ("it was high time that someone gave the foot-user an easy access to great information volumes").

And, naturally, also some negative aspects were detected. At this point we leave out those comments related to comparisons with the usual OPAC. The next point will be devoted to this subject. It is important to consider that to identify negative aspects worth mentioning, the users were obliged to descend to a greater detail level. In fact, they almost had to look for each little detail each one would like to change. As examples, there were aspects such as:

- lack of enough explanations so a new user knows the logical operations sequence.

- difficulty to define one's own query templates and views (non experienced final users).

- impossibility to reach query terms from lists (browsing) working against ARCA servers.

- impossibility to cancel some client functionality (regarding the end users).

- some multilingual interface deficiencies.

In summary, even if each user group appreciates different aspects, the general valuation is *very positive*.

Comparisons with the OPAC

From the considerations used in the above valuations were excluded all those comments and answers which were not focussed on client evaluation, but on the comparison of the client with the user usual OPAC (in most of the cases the SABINI OPAC).

This decision was adopted because these evaluations required the client aspects not supported by the Z39.50 standard, as it was already explained at point 3 while describing the OPAC interface, and required the OPAC aspects not included in a local information retrieval system. In any case, it was considered interesting to present a summary of those comments that are more significant.

In general, users who had participated in the assessment appreciate positively these advantages of the client over the usual OPAC:

-   its facility to carry out a great number of simples queries to different libraries

-   its power to easily build up a wide and exhaustive bibliography from the information available in different libraies, specially when later research is needed.

-   its facility and power to offer access to a great information volume to a new user.

-   the possibility it offers to easily and quickly know holdings existing in other libraries when the usual library cannot satisfy a concrete need.

At the same time, users appreciate positively the following usual OPAC characteristics through the client:

-   its capability to combine result sets.

-   its capability to limit a result set by language, dates, and so forth.

-   its power to perform complex queries using more than one access point, more than one combination among them and more than one limitation of the result to be obtained.

-   its access to the thesaurus with the possibility to navigate through its terms and relationships until creating the desired query.

-   its multilinguality with the possibility to access the same information in the data base using different languages.

Final comment

Perhaps the finnal comment that can summarize all the assessment set carried out in Spain could be the one expressed by one of the most experienced librarians who actively collaborated in the assessment:

> "...if this client were multilingual and would allow the user to navigate through a thesaurus, it will be almost perfect..."

6.   Looking into the Future

Z39.50 functionalities have the potential for improving not only the process of searching for bibliographical information, but also the daily internal activities of libraries, especially the acquisition of cataloguing records. This kind of functionality is very useful for cataloguing operations and particularly useful for ordering documents.

Z39.50 communication could also yield a solution to the problems of bibliographic control and derivative cataloguing. As is well-known, the Italian National Library Service (SBN) allows cooperative cataloguing, but only to its federated libraries. In other libraries, deriving cataloguing records from external sources (such as OCLC), if any, is often carried out with the intervention of trading companies.

Librarians see Z39.50 as a possible future tool to solve many of the current cataloguing problems—but for this to happen, it is necessary that libraries adopt a policy of distributing cataloguing records at low prices.

In the list of positive actions that the European Commission could initiate for libraries, the ARCA librarians suggest that big cataloguing bureaus and all libraries be solicited to promote derivative cataloguing at low prices. Contacts with ICCU are in progress to organize a general discussion on derivative cataloguing in Italy as soon as the ICCU central Index of SBN releases UNIMARC records.

7.   Definitions and Acronyms

ARCA	Access to Remote Catalogues
ASCII	American Standard Code for Information Interchange
GUI	Graphical User Interface
IEI	Istituto per l'Elaborazione dell'Informazione
ICCU	Istituto Centrale per il Catalogo Unico
ISBN	International Standard Book Number
ISBD	International Standard Bibliographic Description
ISO	International Standards Organisation
MARC	Machine Readable Cataloguing
OPAC	Online Public Access Catalogue
OSI	Open Systems Interconnection
RPN	Reverse Polish Notation
SBN	Servizio Bibliotecario Nationale
SR	Search and Retrieve
TCL	Tool Command Language
UI	User Interface
UNIMARC	Universal MARC
WWW	World Wide Web

8. References

[ARCA 1995a]   J. Favaro et. al., "User Interface Application Requirements Document," ARCA Project Document ARCA/T21/SRD, 1995.

[ARCA 1996a]   J. Favaro and S. Hammer, "User Interface Application Design Document," ARCA Project Document ARCA/T22/ADD, 1996.