

## **ABCD, an Open Source Software for Modern Libraries**

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*ABSTRACT: Nowadays, librarians are using various kinds of open source software for different purposes such as library automation, digitization, institutional repository, content management. ABCD, acronym for Automatisación de Bibliotecas y Centros de Documentación, is one of such software. It caters to almost all present needs of modern libraries of any sizes. It offers a solution to library automation with ISBD as well as local formats. It has excellent indexing and retrieval features based on UNESCO's ISIS technology, a web OPAC, and a library Portal with integrated meta-search and content management system to manage online as well as offline digital resources and physical documents and media.*

### **I. Introduction**

Open source software has been used extensively in IT industry. In the library-land, many open source initiatives, such as Koha, Newgenlib, Evergreen, OPALS, Greenstone, DSpace, Plone, Drupal, Eprint, and Joomla, have been taken to provide tools for integrated library management system, digital library, and content management.

ABCD, an acronym for Automatisación de Bibliotecas y Centros de Documentación, is one such software. It has some special features not very common for library software. The radical openness for database-structure and full-text capabilities, which are inherent to the underlying ISIS database technology, provides many tools on one platform.

### **II. Background Information:**

ABCD, in English, is “Automation of liBraries and Centres of Documentation”. The name itself already expresses the ambition of the software suite to provide not only automation functions for traditional libraries but also other information providers such as documentation centers. It is developed by BIREME (WHO, Brazil) in collaboration with the Flemish Interuniversity Council, Belgium, using UNESCO's ISIS database technology. This software provides flexibility and versatility. Any bibliographic

structure, including all types of digital resources, can be managed by this software and created by itself along with non-bibliographic structures. Many workshops are organized all over the world. Recently, the first Asian workshop was organized in New Delhi in May 2011.

### **III. Aims and Objectives:**

The primary aim of ABCD is to provide an integrated library management tool, covering all major functions in a library, such as Acquisitions, bibliographic database management, user management, transactions, serial control, online end-user searching on local and external bibliographic databases, and library portal. It allows bibliographic records imported from other libraries, for example, the Library of Congress, Oxford University, Yale University, Boston University, University of Toronto, University of Chile, and Australian National University, through the Z39.50 protocol, which helps libraries to maintain international standards in bibliographical information such as MARC, CEPAL and AGRIS. ABCD also allows for local customization of Z39.50 servers to suit one's needs.

In general, libraries do not like a software that requires a lot of programming efforts at the local level. ABCD is thus designed as a tool for librarians rather than for ICT technicians. ABCD does requires the use of the 'Formatting Language' of ISIS, which allows library staff to manipulate all data in their databases in a high granular way in order to keep a full control of it without extensive programming. ABCD is a menu-driven software and provides help instruction at every step.

### **IV. Technology and Technical Features**

ABCD is built with such technologies as ISIS database, ISIS formatting language, CISIS, ISIS Script, ISIS NBP, Java Script, Groovy and Jetty, PHP, MySQL, Apache, and YAZ.

Here is a list of major technical features of ABCD:

- The software is fully web-based, so can be used and managed from any current web-browser.

- All main functions of the library management are integrated using the same interface and databases.
- Bibliographic records can be imported from external library catalogs / servers through Z39.50 facilities.
- Full MARC 21 compatibility with fields, indicators, and subfields defined by Library of Congress.
- OPAC with simple Google-like search as well as advanced search with Boolean operators, truncation, and field-limitation for all kind of databases, locally created or external.
- Access to both physical and electronic documents (local or on the internet) with the same interface.
- Library staff can define, copy or edit any new database structure with existing ISIS-applications such as MARC, CEPAL, UNIMARC, and Dublin Core.
- Available in many languages like English, French, Spanish, Portuguese while more language versions are on the way.
- Import and export data in ISO-2709 format or text-format.
- Contents and bibliographic resources, both local and external, can be added easily without HTML-programming.
- The basic loan module offers detailed definition of objects and users categories and policies for each combination, fine calculation and calendar definitions, etc., while the advanced module adds reserve, “my library” page, multiple loan policy definitions, and access to external SQL-based user-data.
- Excellent serials management with a fully implementation of the ISSN standard and union catalog function.
- Statistical report generation with graphical presentation of any defined set of variables in the databases.
- Freedom of database structure. ISIS records carry their individual structural description as a “header” within themselves, unlike that in relational table-based databases where all records in the same table share the same structure by necessity. Therefore, each record can have its own different structure. In fact for most record-related operations in ISIS, there is no need to formally describe the structure. So one could consider ISIS as using “scheme-less” records. As a consequence of this, ISIS accepts any structure and includes structure-definition tools, and so does ABCD.

The following types of material records can be managed with ABCD:

- Language material
- Notated music
- Cartographic material
- Manuscript cart. material
- Projected medium
- Nonmusical sound recording
- Musical sound recording
- Two-dimensional, non-projected graphics

- Computer file
- Kit
- Mixed materials
- Three-dimensional objects
- Manuscript language material

ABCD software is very easy to install. It contains package of all the necessary software programs. One can download the software for Windows or Linux platform.

Download links and more information:

- <http://bvsmodelo.bvsalud.org/php/level.php?lang=en&component=27&item=13>
- <https://sites.google.com/site/abcdlibraryautomationsoftware/>

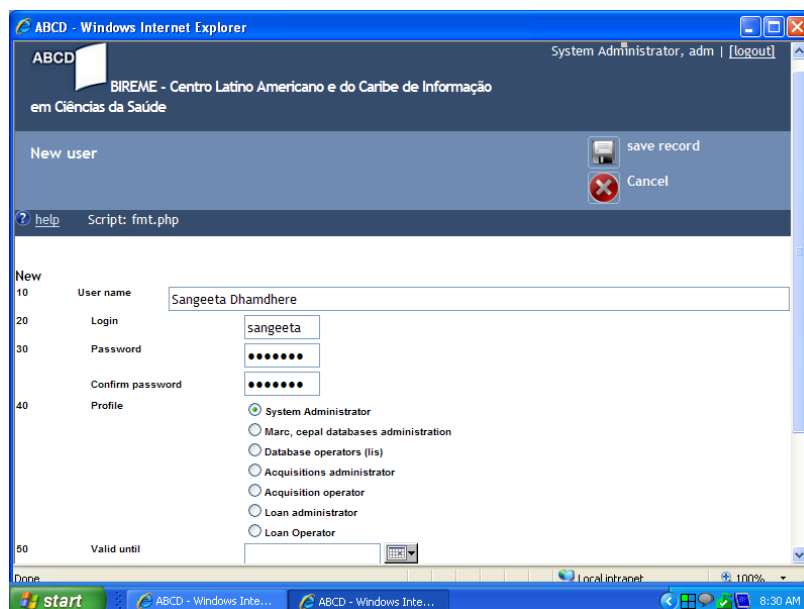
## V. ABCD Modules

The following are available modules in the ABCD software. Each module has a separate login and password. All modules are menu-driven and easy to operate.

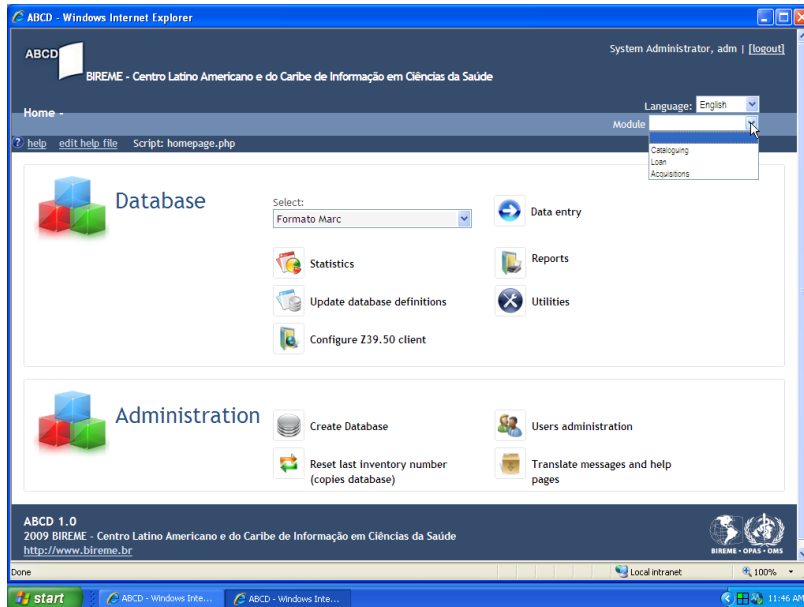
### 1. ABCD Central

It comprises following sub-modules:

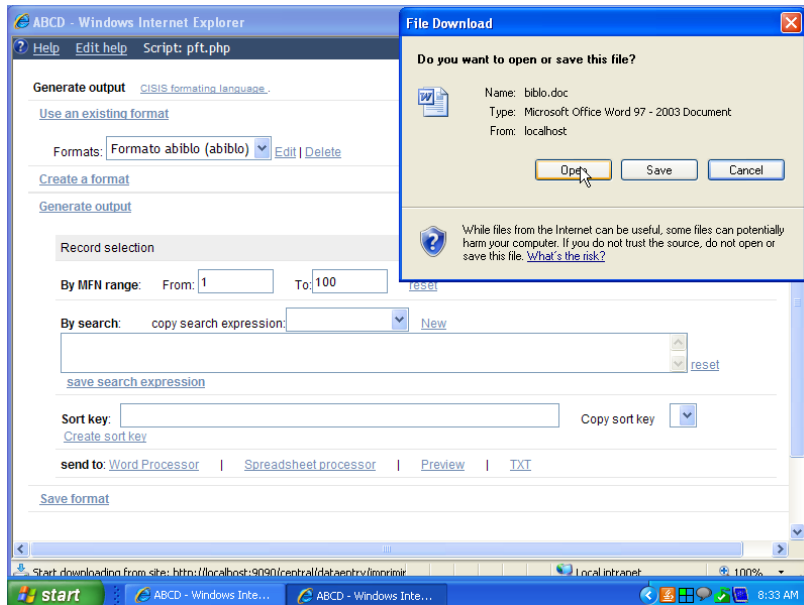
- **Users' administration module** allows specifying user profiles and assigning users to them to define access to any subset of (functions of) different modules and their databases.



- **Database administration module** helps to create new databases from scratch or from the pre-existing database models (like MARC 21, CEPAL).



- **Data entry/cataloguing module** helps to enter data with authority control pick lists, separate handling of subfields (and MARC indicators) or by importing the record from other library catalogs through the Z39.50 facility. The indexing definition can be specified in detail as is the case with the presentation formats. The library staff can generate and print different statistical reports. One can search records through index listings. One can import or export the database or records.



- **Acquisition module** has four major functions:
  - **Suggestions:** starting process of obtaining documents comprising New | Approval / Rejection | Bidding | Decision | Overview
  - **Purchase orders:** the actual process of acquiring documents by creating orders, generating orders from approved suggestions, checking pending orders, and lastly, receiving documents
  - **Databases:** management of the four acquisitions-related databases (i.e., suggestions, providers, orders, and copies)
  - **Administration:** configuration, statistics and reports, weeding
  
- **Loan module** has four major functions:
  - **Transactions:** contains issue, return, renew, fine calculation, borrowers statement, and borrowers history
  - **Databases:** maintains databases of borrowers, transactions, and fines/suspensions
  - **Administration:** generates statistical reports of transactions, fines and users
  - **Configuration:** allows definitions of catalogs, object-categories, user-categories, object/user policies, calendars, time-tables, and currency units

Login details to use Central Module are:

User: abcd

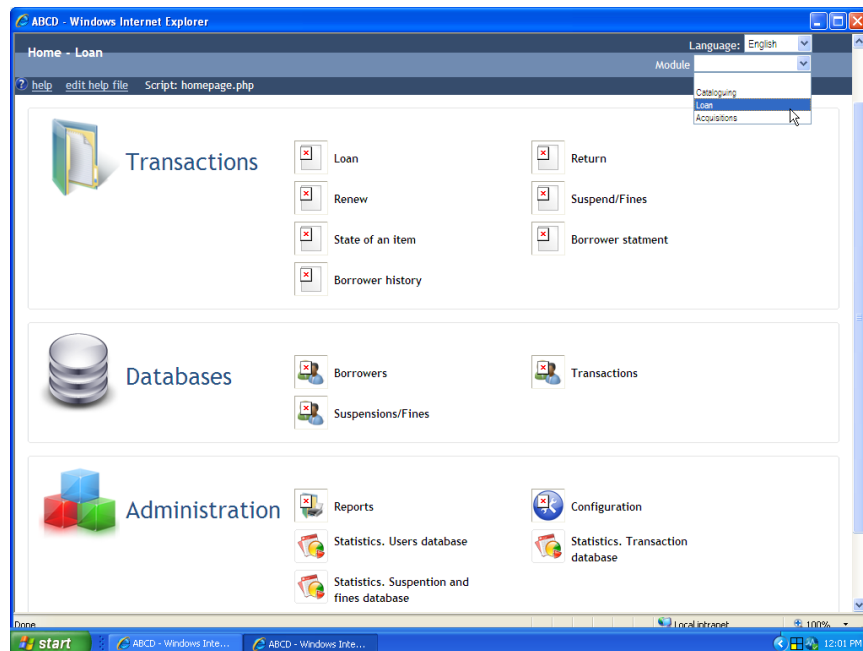
Password: adm

Rights: System Administrator, Database administrator, Database Operators

## ***2. ABCD Advanced Loan Module (EmpWeb)***

ABCD Advanced Loan Module (EmpWeb) caters to the advanced loan management system. Fully based on ISIS-databases, EmpWeb offers for more complex and higher-volume organizations the possibility to store transactions in SQL and retrieve user-data from external SQL (e.g., MySQL, Oracle) data-sets. Using the JAVA scripting language “Groovy”, one can specify more advanced policy rules (e.g., adding the season as a third dimension on top of user/object categories to define the loan policy). All rules are “pipelined” into a queue of conditions to be met before the transaction is granted, allowing to re-order and re-define the queues. EmpWeb adds a personal “my-library” page. Users can

check their own library-loan status from the OPAC and an online reserve possibility. Connections can be defined per IP-number and with time-tables defined per library within the loans-system if so desired.



### 3. ABCD OPAC

ABCD OPAC allows library users to retrieve information from all defined catalogs, databases, and websites with simple, intermediate or advanced interfaces. Results can be displayed in any ISIS-format, including hyperlinks to the original documents for digital library functions, select, print, sent-to-email, bookmark in the major social networks, and export to XML.

### 4. ABCD Site

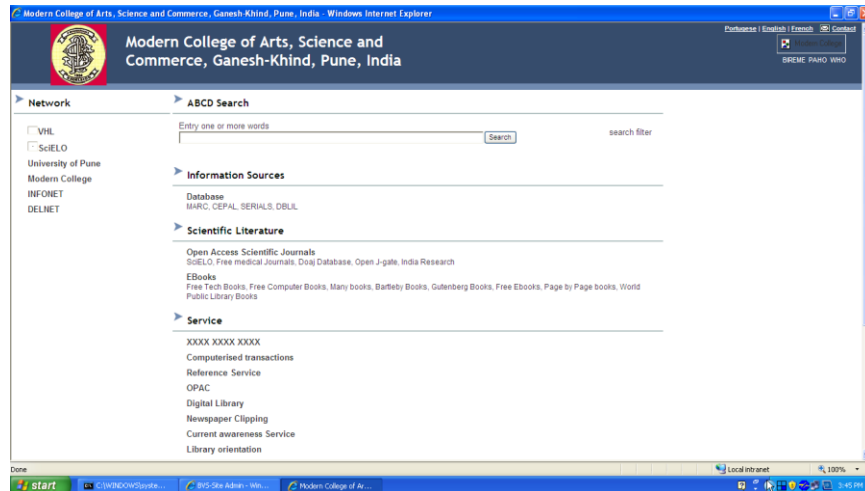
A CMS (content management system) is provided for the creation of the ABCD Site. It enables library staff to create, manage, and publish the portal. The site organizes information in a structure that integrates and interconnects reference databases, specialist directories, events of institutions, full texts collection, and catalogues of bibliographical resources available on the local network or internet. It provides OPAC or search tool for all those resources.

Login details to manage site are:

User: adm

Password: x

Rights: Administrator



### 5. ABCD Serials Control System (SeCS)

ABCD Serials Control System (SeCS) is an advanced management tool for serials or journals (printed and online) of all kinds in a single- or multiple library setup.

- **Management of titles:** It allows adding new serial titles and their details (in the full ISSN standard). They can export records to a union catalogue of serials. They can search titles through a serials index.
- **Management of Titles Plus:** It allows creating and editing records with local administrative information on the serials. Cardex functions are also fully present.
- **Management of templates:** It allows creating and editing masks or templates of serial publication schemes (e.g., 4 issues per volume etc.)
- **Utilities:** It allows user management, library management, statistical reports of serials by library and database. One can get statistical reports of serials holdings (e.g., print, online, free, paid, gift subscription, and exchanged)

Login details to manage this are:

User: admsecs

Password: admsecs

Rights: Administrator

## VI. ABCD as Digital Library Tool



ABCD can operate as a digital library tool with few limitations.

The following are technical characteristics of ABCD that are relevant for digital library applications:

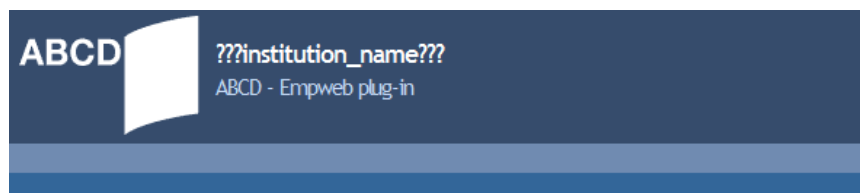
- Full-text indexing. Since its early days, the “classic” ISIS had capabilities to extract individual words, except for non-meaningful words defined in a “stop words”-list, from the fields of records in the database and to index these for searching into an “Inverted File”, which contains not only their record and repeated-field identifiers but also their position in the fields (allowing proximity searching).
- Since ABCD is based on ISIS for the data storage and retrieval on the one hand, and PHP for the web-interface creation on the other, some nice PHP-tools are embedded. For example, FckEditor is a PHP-library offering a full HTML-editor shown below, which can be embedded into a cataloging form to create full documents. Text from Word-documents can also be “copied” and “pasted” into a field of an ISIS-record in ABCD by using this tool. The field will be presented as a web (HTML-) document but keeping the word-indexing technique for retrieval.



#### Technical characteristics making ABCD suitable for digital library applications.

Since this software is fully based on the ISIS-database technology [ref], it inherits the following technical characteristics which are relevant for digital library applications :

- *freedom of database structure* : ISIS records carry their individual structural description as a 'header' with themselves, unlike in relational 'table'-based' databases where all records in the same table share the same structure by necessity, and therefore each record can have its own, different structure. In fact for most record-related operations there is no need to formally describe the structure even, so one could consider ISIS as 'scheme-less' records. As a consequence of this, ISIS accepts any structure and includes structure-definition tools, and so does ABCD.
- *Full-text indexing* : the 'classic' ISIS (for a non-classic new upcoming version, see infra) since its early days (one could say from the 'prehistory' of computer science) had capabilities to extract individual words (except for non-meaningful words defined in a 'stopwords'-list) from the fields of records in the database and index these for searching into an 'Inverted File', which contained not only their record and field identifiers but also their position in the fields (allowing proximity searching e.g.).
- Since ABCD is based on ISIS for the data-storage and -retrieval on the one hand, and PHP for the web-interface creation on the other hand, some nice PHP-tools are embedded. E.g. FckEditor is a PHP-library offering a full HTML-editor which can be embedded into a cataloging form to create full documents. Text from Word-documents also can be 'copy-pasted' into a field of an ISIS-record in ABCD by using this tool. The field will be presented as a web (HTML-)document but keeping the word-indexing technique for retrieval.
- The use of non-Latin scripts. ABCD, as a web-based software, can use non-Latin scripts (e.g., Amharic, Chinese, Greek) as part of the web-browser capabilities. As an example, the following screen-shot is part of the administrator's interface of the EmpWeb Loans module, where Cyrillic and Arab scripts are used in addition to the normal Latin script :



## Operators Administration

### Operators List

<u>Operator Id</u>	<u>Operator Name</u>	<u>E-mail</u>	<u>status</u>	<u>Actions</u>
admin	Empweb Administrator	root@localhost		<a href="#">Edit</a>   <a href="#">Copy</a>
ВПАДИМИР	Vladimir the Russian		Disabled	<a href="#">Edit</a>   <a href="#">Copy</a>   <a href="#">Delete</a>
شريف	Omar Sharif		Disabled	<a href="#">Edit</a>   <a href="#">Copy</a>   <a href="#">Delete</a>
abcd	Administrador ABCD	abcd@abcd.org		<a href="#">Edit</a>   <a href="#">Copy</a>   <a href="#">Delete</a>
ernesto	Spinak, Ernesto	spinaker@adinet.com.uy		<a href="#">Edit</a>   <a href="#">Copy</a>   <a href="#">Delete</a>
egbert	De Smet, Egbert	egbert@ac.be		<a href="#">Edit</a>   <a href="#">Copy</a>   <a href="#">Delete</a>

Tests of ABCD is successful in dealing with Amharic records (in the Ethiopian implementations) and with records in Indian languages (in the workshops). An Amharic and Hindi version of ABCD is being prepared.

In view of the above described possibilities of ABCD, the software can deal with – but within the 1 MB per record limit – a multitude of non-classical library or collection types: theses in higher education institutes, websites, and scientific abstract databases.

#### *1. Theses*

In the example of theses, most of these will be stored as PDF's. Where ABCD still cannot – except for the experimental implementation of a PFD-text extractor unit – index PDF's, the metadata of these documents can be very well managed and searched. In fact, ABCD is much better than Greenstone where the pure XML-storage without a real database-structure of the metadata means that larger collections of metadata will slow down the system considerably.

In the illustration below, taken from the sample CEPAL-database, which is already part of the original first-release of ABCD, part of a record not only shows images related to

the record (covers of the books) but some hyperlinks, of which the first link is a PDF-link:



Datos estadísticos: Liquidez; Indicadores

Categoría geográfica: GRUPO ANDINO

Ubicación: Biblioteca

Solicite el material por este código: 333.444.P579

Me honra presentar este folleto que historia, explica y a Emilio Piriz Pérez señala como tradición en la página 10, a que propuso a Los miembros de la pequeña comunidad je confirmar lo que señala en las páginas 27 y 28 con resp: Gregorio Lanz como colaboración para la coral universitaria que la melodía y la letra están registradas en las Sociedad

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[Letra Musical de MARCHA UCABISTA](#)

[Portada del Libro](#)

[Imagen del Escudo](#)

[Escudo de la UCAB en colores](#)

## 2. Websites

A collection of webpage poses no problems, as web-pages mostly are not larger than the current ISIS-limits and HTML (or XHTML) is pure-text information. Therefore, they can be fully contained inside an ABCD-record. ABCD (or in fact ISIS) can then fully index all words in the records as its normal operational work for retrieval.

ABCD provides database-structure definition interfaces (for the fields, for the indexing table, for the data-entry forms and the 'reporting' formats) and will automatically create all files and full folder-structure. So creating a URL-database with ABCD poses no specific challenges at all.

## 3. Scientific Abstracts

Science community is more focused on abstracts of articles and book reviews while conducting information search, because of the fact that well-written abstracts represent the core-value and results of scientific research in themselves. Therefore, many KPOs

(knowledge process outsourcing) are busy in preparing abstract databases for publishers. If full-text indexed, they provide very handy access to immense scientific knowledge stored in databases.

These abstracts can always be stored and indexed by ISIS. ISIS has no difficulties in dealing with the typical larger numbers of such abstracts. For example, tests are done to convert the full TEEAL database to ABCD (see the illustration below). BIREME has a substantial experience in loading millions of such records with ISIS-technology.

RECID	24
Population	TEEAL1
Firstpage	4
CD_Volume	2
Serialno.	0375-1589
Journal title	South African Journal of Animal Science
Year	1993
Volume	23
Number	1
Author	Schoeman S J Wet R de Merwe C A van der
Author association	Department of Livestock Science, University of Pretoria, Pretoria 0002, South Africa
Title	A comparison between female lambs of the Dorper and two synthetic composites with respect to feed intake, growth and efficiency
Abstract	Ten Dorper ewe lambs and 10 ewe lambs from each of 2 synthetic lines were individually fed in metabolic cages and individual food intake and weight gain were recorded weekly over a period of 34 wk, starting at approx~100 days of age~The data on the 2 synthetic lines were pooled and compared with the data on Dorpers~Food consumption and body weight gain were 53 and 45.5% higher (Pless than or equal to 0.05) in Dorpers than in the synthetic groups~Both intercept and slope for the 2 traits differed between Dorpers and synthetics~After adjusting for differences in mature body weight at equal degrees of maturity, there was still a tendency for the Dorpers to have a higher food intake (by 13.7%) relative to metabolic size and to be less efficient (9.7%) than the synthetic groups~No difference in growth rate per kg metabolic body weight was evident at equal degrees of maturity, which indicates that differences in growth rate are only related to differences in mature size
Acc.no.	930108470
Language	English

(A sample record of TEEAL in ABCD)

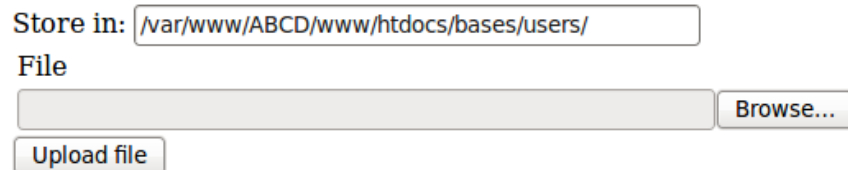
ABCD team is currently working on a rather simple functional extension of the ABCD software. The PHP programming language contains many extensions and libraries or functions, one of which is a PHP-based extractor of words from PDF documents. The idea is to store the extracted words from the PDF document in the record and apply the traditional ISIS-indexing for retrieval and presentation with a link to the original PDF document.

This extension is based on an approach similar to the one already used in ABCD for loading images into records. In fact, it is not the images themselves but the URLs pointing to the image files, kept within the realm of the web-server (ABCD mostly uses Apache) for access rights reasons, are stored.

 First an icon is presented next to a field for uploading a file:



When clicking on this upload icon, a dialog is presented to identify the file to be uploaded (in this case, it would be a PDF):



Now, the PDF-extractor will be launched to extract all words in the PDF document into a text file. This text file will act as the input file for a command, by which ISIS (the mx-tool of the CISIS-utilities package) can create a field of a record in the database, taking and indexing all words of that input-file.

The mx-utility is a full ISIS-engine running from the command-line, which can take a multitude of parameters, some of them identifying the input to act on (e.g., a database, an ISO-file, the console, or a sequential file: `mx seq/1m=filename` where the `/1m` optional parameter indicates the use of the much-higher-than-standard 1 megabyte option and the filename would be the output of the PDF extractor control.

mx, like ISIS, can also run a process (with the 'proc=' parameter) to add the output of the processing of the input (e.g., the words from the PDF) into a field of the actual record.

Standard ISIS-capabilities to full-text index this field will be applied and all words of the PDF are then available for searching. The record will be displayed as text format and the PDF itself will be available by a hyper-link.

ABCD has, as part of the software suite, a full-fledged CMS to create a portal, integrating not only links to external information resources and messages for the users in the same web-page with the links to the OPAC's or the databases available, but also providing a simple search box in which a Google-like search statement can be sent out to interrogate all defined databases. These can be both local ISIS-databases (e.g., the catalog to the

books on the shelves and the digital library collections!) and remote databases in ISIS-format.

▶ **ABCD Search**

Entry one or more words

Search

▶ **Information Sources**

**Database**

MARC, CEPAL, DBLIL, Serials (Main), Facultad de Agronomia

▶ **Scientific Literature**

**Open Access Scientific Journals**

SciELO

The searches are performed one by one and the results of these searches will be presented separately (so not a real federated search).

▶ **ABCD Search**

home > ABCD Search

Entry one or more words

hiv

**Result**

**Database (26 Result)**

MARC (26)

CEPAL (0)

DBLIL (0)

Serials (Main) (0)

**Open Access Scientific Journals (0 Result)**

**Events directory (35 Result)**

Events directory (35)

**LIS- Health Information Locator (485 Result)**

LIS- Health Information Locator (485)

Users could search in one effort both the physical library collections and the digital libraries, since all these are just ABCD-databases combined in the ABCD-Site. This might be a real value-added solution as compared to using, for example, Greenstone next to the classic library catalog software.

Currently UNESCO is supporting efforts to redesign, quite drastically, the storage and indexing engine of ISIS by replacing the “classic” technology of ISIS with a new database (Berkeley DB, see:

<http://www.oracle.com/technetwork/database/berkeleydb/overview/index.html>), based on the same no-SQL principles of ISIS where records are just numerical identifiers followed by an “object”, which could be an ISO-2709 record, a BLOB, an XML-record, etc.), and a new indexer, Lucene (<http://lucene.apache.org/java/docs/index.html>). Lucene is widely used nowadays for full-text indexing and adds to the existing features of the ISIS-query language things like relevance ranking and search-keys without limits (the current limit for search-keys in ABCD is 60 characters).

A fully Java-based interface for this new-generation ISIS is already available as J-ISIS, and a web-interface running on top of the J-ISIS server part is also available as Web-JISIS3.

Apart from the fact that this J-ISIS technology uses Berkeley DB (currently from Oracle) as its storage engine, which drops all limits of record and field-lengths and database-sizes as well.

Another important feature in the context of digital libraries is the UNICODE capability. Any scripts can be mixed in the databases in J-ISIS. This is important for digital libraries, which often deal with local cultural heritage collections, using local scripts. Research is being done on creating a digital library for Tigrina Gee'z (north of Ethiopia) manuscripts but the success and relevance of Greenstone in this area is most obvious from the many samples on their website. That is one of the reasons why UNESCO supports Greenstone. And these new efforts on making ISIS UNICODE-compatible will hopefully also get support from UNESCO.

Further research and implementation efforts will now look into the possibilities of using the rich Java-based libraries for extracting words from PDF and other document formats (see PDFBox at <http://java-source.net/open-source/pdf-libraries/pdf-box>) while Lucene has no problem indexing huge amounts of such text-files.

Hopefully, ABCD 2.0 will be ready in a year or two to make a transition to this exciting new environment and therefore offer almost unlimited possibilities to handle digital library collections.

At present, ABCD is being introduced and implemented by many university libraries in Africa and Latin-America.

## **VII. Conclusion:**

Along with other free open source software, ABCD offers a nice solution for all types of modern libraries to meet the ever-increasing needs of users when library budget is on the decline. Libraries can make use of this open source tool for library automation easily without any technological background as its installation and configuration are almost entirely menu-driven.

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