

A comparative study of the open source digital library software

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Abstract: The purpose of this paper is to evaluate five Open Source Digital Library Software (OSDLS), which used PHP programming languages in order to justify our choice to determine which OSDLS packages offer more in terms of services and their easy use. We used a comparative study with the features of this five OSDLS based on their finalization and maturity. In this paper, we found that PMB (PhpMybibli) software satisfies the main functional requirements of a library management system.

Keywords: Open source digital library software, OSDLS, Comparative study.

1. Introduction

Most of the libraries can not buy commercial software due to severe budget constraints such as the high price of the library software. Therefore, they express their needs to use Open source software.

Open source Digital library software (OSDLS) is important as it can support different needs with low cost and the source code is available for amendments and improvements.

The authors [1] reported that Digital libraries (DLs) could facilitate creation, organization and management of multimedia digital content and collections. They and provide search, retrieval and other information services over computer networks and other electronic media. It is preferable to use open source software to build a digital library under economic conditions.

Biswas defined Open-source software as a software for which the source code is freely available for anyone to see and manipulate. [2]

According to Lee [3], development of open source software creates effectively digital library operations without financial investment.

Biswas [2] stated various advantages of open source as follow:

- The unrestricted use
- The free cost
- The community involvement in the development and maintenance of software
- The competence compared to other commercial software
- The issues of copyright etc.

The table 1 presents the latest releases of OSS packages and their language support. These packages are available freely on the web.

Table 1. Open source software packages for digital library and content management

Software	Platform	Programming Language
ABCD	Cross platform	PHP (only EmpWeb module is programmed in Java)
Alfresco Community	Cross platform	Java, JSP and JavaScript
Biblioteph	Cross platform	PHP
BiblioteQ	Cross platform	C++, Qt
CDS/ISIS	Dos/windows/sco Unix	Pascal
Dspace	Cross platform	Java
Emilda	-	C++, PHP, Perl
Eprints	Cross platform	Perl
Evergreen	Linux	Perl, C, XULRunner
Fedora Commons	Cross platform	Java
Ganesha	Cross platform	PHP
Greenstone	Cross platform	C++, Perl, & Java
Invenio	Unix, Windows	Python
Koha	Linux	Perl
MyCore	Cross platform	Java, JavaScript, XSLT
NewGenLib	Cross platform	Java, JDOM
OPALS	Linux	Perl
OpenBiblio	Cross platform	PHP
Potnia	Windows	PHP
Voyager	Windows	Perl script
Zotero	Cross platform	JavaScript

In this comparative study, we have adopted open source software packages using the PHP language and support windows for the following reasons:

- PHP is the most adopted language for majority of Moroccan universities.

- PHP is easily implemented.
 - PHP is a reliable and powerful language.
- In what follows, we present the Open Source Software (OSS) packages using the PHP language, which participate in this comparative study, namely, ABCD, OpenBiblio, PhpMyBibli and Potnia.

• **ABCD:**

ABCD is the acronym for a software suite for the automation of libraries and documentation centers. 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, and using UNESCO's ISIS database technology. It aims 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. The main characteristics of ABCD are the coverage of the main library functions, its web centrality and its development and maintenance under the methodology of Free and Open Source Software.

• **OpenBiblio :**

OpenBiblio is an integrated library management system, it was created in 2002 by Dave Stevens under GNU GPL. It was designed for small libraries, above all

school libraries. This system was translated into Spanish called EspaBiblio.

• **PhpMyBibli :**

PhpMyBibli (PMB) is an open source integrated library system. It is developed & maintained by the French company PMB Services in 2002 under the CeCILL licence. PMB is designed for medium-sized and large libraries, and can also manage networks of libraries integrated in a collective catalogue. The cataloguing format used is UNIMARC but it incorporates format conversion and importation systems (USMARC and XML, among others).

• **Potnia :**

Potnia creates thematic directories, for the management of scientific resources, journals, publications. It was created in 2003 by the Directorate General of Universities of the Spanish Ministry of Education, Culture and Sport. It has a Spanish language interface.

• **Bibliotecaphp :**

Bibliotecaphp is an open source web-based. Program for management of a small library written in PHP without a database. This program has been developed by J.E. Amaro in a project teaching innovation of the University of Granada.

The table 1 presents the latest releases of OSS packages. These packages are available freely on the web.

Table 2. Sources LMS Packages

Software and web address	Developer	License	Latest release
ABCD(https://sites.google.com/site/abcdlibraryautomationsoftware/downloads)	BIREME (WHO, Brazil) in collaboration with the Flemish Interuniversity Council (VLIR, Belgium), using the UNESCO's ISIS database technology.	GNU Lesser Public License	2.0 September 22, 2011
OpenBiblio (http://obiblio.sourceforge.net)	OpenBiblio Development Team	GNU GPL	0.7.2 in Aug 13, 2014
PhpMyBibli (http://www.sigb.net)	PMB Services	GNU GPL & CECILL	4.2.7 in July, 2016
Potnia(https://sourceforge.net/projects/potnia/)	Directorate General of Universities of the Spanish Ministry of Education, Culture and Sport	MPL 1.1	1.0. 12, October, 2003
BibliotecaPHP(http://bibliotecaphp.sourceforge.net/)	J.E. Amaro	Gnu GPL	1.1 April 04, 2010

Table 3. Languages support, documentation and size for the software

Software (Latest release)	Languages	Documentation	Software size
ABCD	Multi-lingual	Available in English, French and Spanish(http://wiki.bireme.org/en/index.php/ABCD_resources)	48.6Mo
OpenBiblio	English and translated into Spanish	Available in English(http://obiblio.sourceforge.net/)	759.1 KB
PhpMyBibli (PMB)	English, French, Spanish, Italian, Arabic, Dutch and Portuguese	Available(http://www.pmbservices.fr/index.php?cms_build_activate=1&lvl=cmspage&pageid=20) in French PMB release 3.4	55.2MB
Potnia	Spanish	Available in English https://sourceforge.net/projects/potnia/files/potnia/Potnia%201.0/	162.5Kb
BibliotecaPHP	Spanish	Available (https://sourceforge.net/projects/bibliotecaphp/files/)	176.1Kb

Table 4. Development information of OSDLS Packages

Software	1 release year	Latest release year	Platform	Backend database	User Interface	Programming Language
ABCD	2011	2011	Cross platform	Mysql	Web-based	PHP (only EmpWeb module is programmed in Java)
OpenBiblio	2002	2014	Cross platform	MySQL	Web-based	PHP
PhpMyBibli	2003	2014	Cross platform	MySQL	Web-based	PHP
Potnia	2003	2013	windows	MySQL	Web-based	PHP
BibliotecaPHP	2010	2011	Cross platform	-	Web-based	PHP

The rest of the paper is organized as follows: Section 2 provides a review of the related work. Section 3 analyses the aims of the paper and the evaluation methodology. Section 4 presents the result of the evaluation. The conclusion of the evaluation is discussed in section 5. Finally, the paper is concluded in section 6 including a few perspectives.

2. Literature review

Gkoumas[4] demonstrated that open source library management software can support different needs with low cost and the source code is available for amendments and improvements. This study found that OSLMS are still suffer from some problems such as: official installation manuals are available in English only, less popular languages like Greek that does not support this software (Exceptions are the Greenstone, BiblioteQ and Invenio). Nevertheless, all the evaluated software can be used for the creation, distribution, management and support of digital content. The Gkoumas's work presented a number of realistic scenarios and proposed the usage of specific tools based on time, technology and staff constraints as follows:

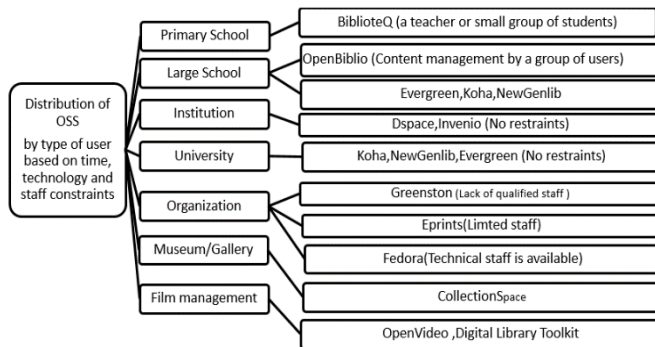


Figure 1. Distribution of OSS by type of user based on time, technology and staff constraints.[4]

From the comparative study that Gautam[5] made from the review of earlier studies, information from the webpages of the library management software packages and hands on practice in local installation done, he concludes that Koha is a true market leader among the open source LMS products.

Balnaves [6] demonstrated that Koha, Evergreen and PMB are very active developer communities with secure institutional backing.

Salve [7] focused on the general and specific features of the some popular OSS packages used in library activities'.

Yang & Hofmann [8] studied the features of OPACs of Koha and Evergreen and one proprietary of Voyager.

Bal[9] made a view report on Cataloguing Module of

Library Management System (LMS). In this study, they proposed requirements for an initial prototype of LMS such as the system should support for creating multiple databases, different levels of indexing, different mode of searching, multilingual system and the migration of data to different data formats and different bibliographic systems.

Macan [10] presented an overview of the two open source (OS) integrated library systems (ILS), namely, Koha and ABCD, and they found that Koha has more functionalities than ABCD, and it has a good IT support. The authors reported that Koha is an open source ILS with a wider community which has to be considered for implementation, while, ABCD has great metasearch possibilities.

In their online survey about Dspace, Greenstone, Eprints and Fedora, Biswas and Paul [11] concluded that open source DL software empowers non-privileged groups. They also concluded that Dspace is powerful DL tool and commonly used in education.

Singh & Sanaman [12] made a comparative analysis dealing with the quantity and the quality of Koha and NewGenLib open source LMS. Based on study of reference tools, reference statistical data available and related literature, Singh and Sanaman stated that Koha and NewGenLib are important in different aspects.

According to Witten [13], Greenstone is a complete DL software system a presented the features and evaluated Greenstone. They concluded that is a complete software system. In 2004, Witten et al[14] evaluated Greenstone because non-specialist users can use it easily in building, assembling and conceiving new information.

Pyrounakis and Nikolaidou [15] studied the features of Dspace, Fedora, Greenstone, keystone and Eprints. They suggested that each system is suitable for a certain case. For example, Dspace is suitable for an institution dealing with research papers and theses. Anuradha[16] integrated full-text search in Koha with Greenstone and Fedora.

When Naik and Shivalingaiah[17] studied features, functions and usability of OSS like Greenstone, Dspace Ganesha, they concluded that OSS has an easy interface that enables users to make library collections and it involves library staff in projects.

Breeding [18] studied the OSS involvement in the library automation industry. They provided a new set of ILSs and how companies can adopt services and support instead fees. They also provided information about Koha, Evergreen, NewGenLib and OPALS. stated that the four open source LMS products,

namely, Koha, Evergreen, NewGenLib and OPALS are widely implemented and they can be good examples of the current state of the art of the open source LMS. According to Breeding, the functionality of ILS has developed fast since most libraries adopt ILS software and sponsor projects. However, libraries that use open source ILSs should review their features, functionality and measure their needs.

According to Cherukodan[19], DL was successful with users from 78 countries. They also described the design and development of DL software like Dspace at Cochin University of Science and Technology, India. They adopted the analysis of distribution of items and measuring the value of usage statistics employing the Google Analytics service.

Gairin [20] presented an experiment performed at School of Library and Information Science at the University of Barcelona. The study involved the OSS characteristics, functions and modules. The OSS members developed a virtual laboratory for the use of OSDLS. They used PMB, OpenBiblio, Potnia, Alfresco, Dspace, Eprints and Refbase. These OSS systems are used for the management of electronic resources, electronic documents, repositories, thesauri and bibliographies. Gairin conclude that the virtual laboratory not only tests and promotes OSS, but also provides teaching and learning materials for teachers and students.

Krishnamurthy [21] concluded that open source movement provided valuable software and helped societies to grow.

Hassan [22] studied the most popular OSS namely, Koha, NewGenLib, Greenstone, DSpace, Fedora, Eprints, Ganesha, CDSWare, CDS/ISIS. They stated that DSpace, Eprints, Greenstone and Koha are widely used in India because they are flexible in searching and browsing with less effort.

To know the most used software in developing countries, Shafique and Mahmood [23] created a methodology based on questionnaires, interviews, document analysis and personal communication. They made a list of recommendations related to the selection of a the desired software in developing countries.

According to Witten [24], Greenstone led to the spread of DL technology in developing countries. This study discussed the Greenstone origin and usage. Greenstone made cooperation with human info and UNESCO because of its international and humanitarian interest.

Vasupongayya[25] studied traditional library services, management of digital files, interoperability and basic common functions such as security, alert system and

statistical reports. Their work provided as technical compatibilities, supported environment, programming language requirements, basic requirement and active support.

Madalli[26] observed the digital preservation support in DL software such as CDS, Invenio, DSpace, Eprints, Fedora, Greenstone and MyCoRe. They concluded that the preservation of digital information is still in an experimental state and development. According to this study, items can be uploaded into a digital archive for future storage, retrieval and preservation if these items are converted from proprietary formats into open formats. Even that Fedora supports features from a digital preservation; it is not widely used because of its difficult interface. Dspace and Eprints are widely used in digital and institutional repositories.

Dhamdhere[27] provided by the features of ABCD and its modules. They stated that ABCD satisfies the needs of modern libraries.

Goh [1] created a checklist to evaluate DL digital library and used this checklist on CDSware, Eprints, Fedora and Greenstone. The checklist identifies DL software features such as content Management, user interface and user administration. The evaluation showed that DL software lacks some functionalities. The result was that Greenstone could fulfill the indicators because it supports end-user functionality. According to Goh et al, the four evaluated tools involve strengths and weaknesses.

Arora [28] discussed the genesis and structural components for an open source MusicXML DL platform that may be of interest to librarians with and without musical and/or programming backgrounds.

Harinarayana and Raghavan[29] concluded that CDS/ISIS and LibSys do not support all features for retrieval.

There are several studies regarding the user satisfaction and the usability of Open source DL software. This study is concerned with the features of the usability DL tools. It is also an attempt to assist organizations to choose the right software. In addition to these purposes, the study determines which OPAC of the eight OSDLS packages offers more services.

3. Objectives and methodology

The main purpose of this study is to help the adoption of open source DL management systems, by highlighting their futures and presenting a list of usage scenarios, based on the needs of different establishments.

The work reported in this study is divided into four stages:

- Installation and utilization of the open source tools;

- Record of the features of the software;
- Evaluation of the software
- Choice the OSDLS

To justify our choice to use the OSDLS packages, we will adopt a comparative study of OSDLS existing in the market in terms of their librarianship functionality by using measurements of the finalization and the maturity of the software functions.

The finalization and maturity are the two measurement elements that describe each specification.

To compare these OSDLS, we adopt the scoring

system defined by Tristan Muller [30] presented in the table as follows with the grade scale is from 0 to 7, where 7 is the highest.

Table 5. Scoring system scheme defined by TirstanMuller[30]

Specification	Grade scale	Performance
No available	0	Not evaluate
Available	1	The implementation is poor - undesirable
	2	At just acceptable
	3	Adequate but little significant improvement
	4	Good
	5	Very good
	6	Implementation excellent - little improvement
	7	Remarkable implementation - no observed default

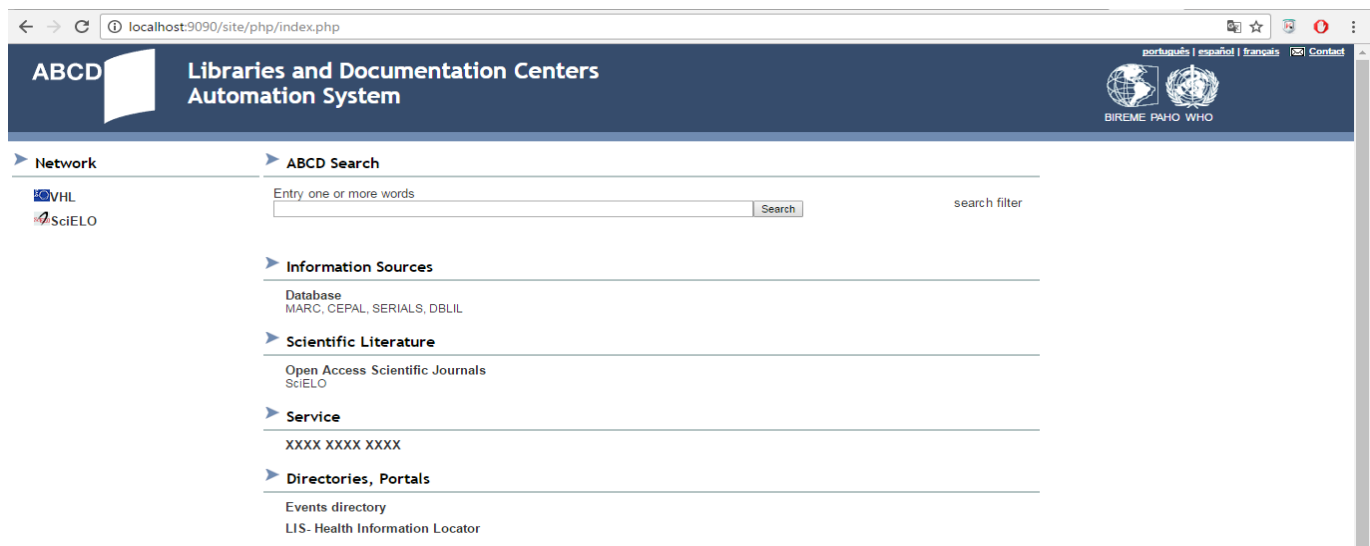


Figure 2.ABCD OPAC page

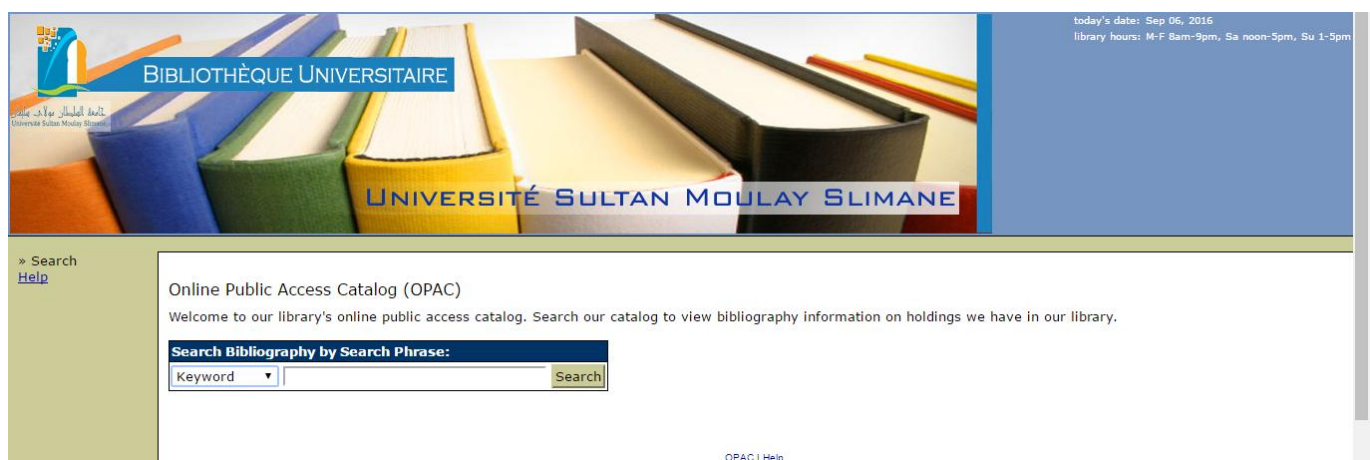


Figure 3. OpenBiblioOPAC page

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Figure 4. PhpMybibliOPAC page

127.0.0.1/ComparativeStudy/potnia10/potnia/clientbuscar.php



Inicio | **Búsqueda Avanzada** | Administración | Ayuda

Búsqueda avanzada

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Potnia fue la diosa más importante del Heládico Tardío. Se la menciona en tablillas en lineal B de Knossos y Pylos, y se representa junto a serpientes, leones, grifos... Es la protectora de la naturaleza y la fertilidad, y se relaciona con la diosa madre de la tierra.

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Potnia ha sido desarrollado en el marco del proyecto EA200352, de la Dirección General de Universidades, Min. de Educación, Cultura y Deporte. Versión 1.0. 12 de Octubre de 2003
Potnia es software libre, <http://sourceforge.net/projects/potnia>

Figure 5. Potnia OPAC page

← → 127.0.0.1/ComparativeStudy/bibliotecaphV1_1/bibliotecaph/biblioteca.php?busqueda=@



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100-COU-2	COURANT R. ; JOHN F.	Introduction to the calculation and mathematical analysis. VOL.2	u4
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150-HOR-1	CAY Horsmann	JAVA ESSENTIALS	u6
150-PAL-1	GRANT PALMER	PROGRAMMER JAVA'S REFERENCE	u7
150-CAB-1	LUIS M HEADS	PHP 5	u8
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11 books found

Figure 6.BibliotecaphOPAC page

Table 6. The main features of the five OSS packages

Features	ABCD	OpenBiblio	PhpMybibli	Potnia	BibliotecaPHP
Administration	1	1	1	1	1
Circulation	1	1	1	0	0
Cataloguing	1	1	1	1	1
OPAC	1	1	1	1	1
Reports	1	1	1	0	0
Acquisition	1	0	1	0	0
Serials management	1	0	1	0	0
Total	7	5	7	3	3
Percent %	100	71.43	100	42.86	42.86

Table 7. The evaluated functionalities of the fives OSS packages

Features	ABCD	OpenBiblio	PhpMybibli	Potnia	BibliotecaPHP
Administration	4	4	6	2	2
Advanced search	4	0	6	4	2
Authority control	4	4	6	2	4
Basic search	6	3	6	4	4
Cataloguing	5	4	6	1	2
Circulation	5	3	6	0	0
Serials management	4	0	4	0	0
Documentation	2	2	2	1	2
Documents acquisitions	4	0	5	0	0
DSI	4	3	5	0	0
Export / import data	4	3	5	0	0
Inter loanlibrary	0	0	0	0	0
Supported metadata standards	5	5	5	0	0
OPAC	4	3	4	2	3
Renewal	4	4	5	0	0
Report & Statistics	4	4	4	0	0
Reservation	5	0	6	0	0

Semantic search	0	0	0	0	0
Share on social networking sites	0	0	0	0	0
A social feature such as like , comment	0	0	0	0	0
Multi language support	4	2	6	1	2
User assistance	4	4	5	1	4
Z39.50 protocol	4	0	6	0	0
Total	80	48	98	18	25
Percent %	51.95	31.17	63.64	11.69	16.23

The next section, we present the results of this study including the analysis.

4. Results and discussion

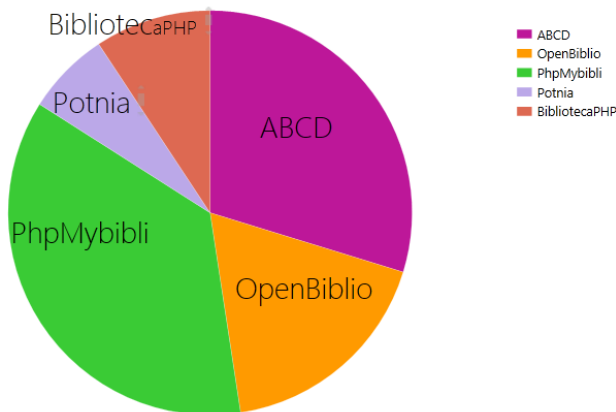


Figure 7. Result of evaluation features

In this study, most Open Source Software packages exist under a standard license agreement Gnu GPL [31], that defines the terms of use. Only Potnia is under MPL1.1.

The table 5 presents in the previous section demonstrate that ABCD and PMB have all main functionalities that each digital library must have it.

The table 6 and the figure 7 shown that PhpMybibli are the most appropriate solution for each digital library (more than 63% for PMB software), the second position is the ABCD library software (nearly than 50%).

5. Conclusion

According to this study, PMB (PhpMybibli) was a more appropriate solution for libraries, but there are gaps to develop it in the future works, such as a semantic search, report and add a new functionalities in the OPAC interface.

In the next work, we will try to compare all open source software in different programming languages exist on the web and to develop it to meet the needs of decision makers, administrators, librarians and users.

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