



A Comparative Analysis of Open-Source Discovery Tools Used in the Next Generation Library Cataloguing System

Dr. Debabrata Barman

Librarian, Krishnath College, Berhampore, Murshidabad, West Bengal

Dr. Anirban Dutta*

Librarian, Krishna Chandra College, Hetampur, Birbhum, West Bengal

(* Corresponding Author)

Prof. (Dr.) Parthasarathi Mukhopadhyay

Professor, DLIS, University of Kalyani, Kalyani, Nadia, West Bengal

Abstract

This article evaluates the features and usability of open-source discovery tools, pointing out the benefits and drawbacks to assist librarians in determining the best tool to improve the single-window experience and make library operations run more smoothly. A comparison study looks at open-source discovery tools based on their features, such as search-enhancing tools, support for standards, and library automation modules. This study determined that VuFind is the most comprehensive open-source discovery tool because of its extensive functional features and ability to integrate easily with current library systems. This unique study evaluates open-source discovery tools for next-generation library cataloguing systems that provide insightful information for libraries by emphasising the best tools—like VuFind—after carefully examining their features, usability, and integration potential.

Keywords: Cataloguing 2.0, Library User Interfaces, Next Generation Library Catalogue, Open-Source Software, VuFind, Web-Scale Discovery

1 Introduction

Academic library users increasingly expect seamless access to both physical and digital resources through a single search interface. This search box should support metadata and full-text searches while offering user-centric services for a streamlined experience. Library cataloguing systems now manage a wide array of resources, including digital content, user-generated information, and physical collections, creating a growing demand for more accessible and efficient discovery systems. While commercial solutions provide robust unified search capabilities, their high costs make them inaccessible for many institutions, particularly in developing countries like

India. Open-source software presents a practical alternative, more flexible, and innovative library cataloguing to consolidate resources without the financial burden of proprietary systems. Smaller academic libraries, such as college libraries, can develop affordable and user-friendly discovery systems using open-source tools and standards. These systems eliminate retrieval silos, integrating access to books, journals, databases, and more through a single search interface. Ultimately, they improve the user experience and enhance the accessibility of diverse library resources, meeting modern demands for efficient information retrieval.

Open-source development's collaborative nature allows libraries to benefit



from a global developer and user community. This community-driven approach helps software adapt to library and user demands. A unified search interface improves user experience and information retrieval in open-source discovery tools. User-centric design makes open-source discovery tools popular. Faceted search, relevance rating, customizable displays, community support, high installation rate, and protocol integration make VuFind the most comprehensive open-source discovery tool for finding and accessing information (Roy et al., 2022). These user-experience-focused systems are a combination of traditional library cataloguing and modern information-seeking. The present study is conducted with web-based content analysis during the years 2016 to 2022.

This comparative analysis will examine multiple open-source discovery technologies, such as Blacklight, eXtensible Catalog, Fac-Back-OPAC (Kochief), LibraryFind, Rapi, Scriblio, SOPAC, and VuFind. The capabilities and implications of these technologies on library services will be evaluated by examining their search-enhancing features, standards-supporting features, and functional characteristics. The priorities will include search accuracy, speed, user contentment, system interoperability, and user experience (Emanuel & Columnist, 2011). The study will highlight implementation best practices and solve library problems using open-source solutions. Sen and Das (2022) discussed the present information and communication technology infrastructure and the contemporary use of electronic information resources in college libraries under West Bengal State University.

The next-generation library cataloguing systems with open-source discovery tools are a significant technological development. These tools improve resource discovery, user engagement, library

collaboration, and creativity. Understanding these instruments' capabilities and effects is essential for libraries' strategic planning and decision-making as the digital landscape changes. This comparison research will help libraries choose and use the best discovery tools.

2. Review of the Related Literature

Library discovery technologies transform cataloguing with flexible, customized knowledge organization systems (Gnoli et al., 2024) and affordable user solutions. These technologies and next-generation cataloguing systems have better user interfaces and functions than OPACs. A literature review examines open-source discovery tools' creation, installation, and performance in next-generation library cataloguing systems. Ahammad et al. (2024) and Arbor (2023) emphasize the importance of community support, funding, open-source tools, customization, and locally controlled, cost-efficient systems for sustaining library software solutions (Corrado, 2023) and the advantages of local control over commercial systems. Nagy (2011) proposed features such as faceted navigation and relevancy rating and integration with external data sources for "next-generation catalogues" (hereafter called NGCs), setting a standard for future systems (Balaji et al., 2021). According to Sivasankari et al. (2024), the application of AI improves resource discovery and user engagement through recommendation systems, which makes libraries more responsive, user-centered, and efficient. Dutta and Mukhopadhyay (2021) developed a navigational framework based on bibliographic relationships to support the serendipitous discovery of information. Mettai and Boumarafi (2023) explore how discovery systems improve resource discoverability and retrieval for users in



electronic information services and institutional repositories. Again, McKay and Buchanan (2014) stated that user-centric catalogues are more usable and accepted by users. Only some open-source discovery software, such as Blacklight, VuFind, and SOPAC, has significantly shifted towards next-generation cataloguing systems, providing distinct benefits and presenting particular difficulties (Wynne and Martha, 2011). Mukhopadhyay and Mukhopadhyay (2023) used VuFind, an open-source Solr-based library discovery software, to integrate geodetic search to improve library information retrieval in their prototype framework. Three other scholars, namely Roy, Biswas, and Mukhopadhyay (2018), conducted a more detailed analysis of VuFind's capabilities, specifically focusing on its capacity to improve the discoverability of library resources (Widiastuti, 2022). Singh and Kaur (2023) demonstrate that the VuFind open-source tool improves library catalogues by adding a modern search interface, checking for availability in real-time, and other advanced features. Jayakanathan (2021) proposes an ILS-DI (Integrated Library System–Discovery Interface) framework that integrates Koha ILS with the VuFind discovery system. Tunga (2021) has conducted a study with web-based content analysis of university library websites of state-aided universities located in Kolkata city in West Bengal during October to December 2020. Barman (2020) highlighted the development of a Unicode-compliant, multilingual VuFind-based interface for Bengali script in West Bengal libraries. Researcher Heller (2021) examined the significance of Blacklight in contemporary discovery systems, highlighting its versatility and robust search functionalities. Recently, Neslin and Taylor (2023) showed how Blacklight integration with library systems

improves resource access and customer satisfaction. According to Hadro (2010), SOPAC allows users to add tags, reviews, and ratings, making it more dynamic and community-oriented. After that, Rice and Wheatley (2018) observed that it positively impacted patron interaction and participation in the collection. Sivo, Saunders, and Lee (2016) stressed the need for community support and ongoing development for the sustainability of open-source software in the library (Katz & Nagy, 2013). Vastrad, Bharathy, and Kumar (2011) examined the capacity of federated search to offer uninterrupted access to a wide range of information sources and improve user experience. In 2017, Chew, Rahim, and Vighnarajah looked into the fact that using discovery tools like EBSCO Discovery Service shows that combining powerful discovery tools with federated search capabilities has many benefits.

The literature shows how open-source discovery tools transform next-generation library cataloguing systems. Open-source solutions like VuFind, Blacklight, SOPAC, and others improve accessibility, user engagement, technical maintenance, and community support issues to succeed. Future research should focus on long-term sustainability and best practices for integrating these technologies into library settings. A centrally indexed biblio-cultural information system with multiple retrieval silos as a single-window search mechanism for bibliographic and cultural resources was developed by Dutta and Mukhopadhyay (2022).

3 Objectives of the Study

The study was conducted to compare how well different open-source discovery tools work, their features, and how simple they are to use with the following objectives:



- ❖ To identify the necessary widely used open-resource discovery tools for libraries
- ❖ To develop a set of evaluating criteria or parameters
- ❖ To compare the open-source library discovery tools based on some specific parameters
- ❖ To establish the functional modules of library automation in housekeeping operations and information retrieval, including OPAC

Specifically, the paper tries to determine each tool's strengths and weaknesses so librarians can choose the best resource discovery tool for their particular libraries. It also looks at how these tools can improve the user experience and make library processes run more smoothly.

4 Research Methodology

The study has considered two broad components such as selection of the open-source discovery tools; and compares those tools based on some specific parameters. Before selecting a tools, we determined that an updated review of the adoption of discovery tools was necessary. The study proceeded with the following steps - a) compiling an exhaustive list of all open-source discovery tools; b) developing a set of evaluation criteria or parameters; c) review and evaluate several websites to select the comparing criteria / parameters for each discovery tool; d) collected secondary data analyse manually.

The authors compiled a list of ten open-source discovery tools, namely, Blacklight, Collective Access, eXtensible Catalog (XC), Fac-Back-OPAC (Kochief), INSPIRE Discovery, LibraryFind, Rapi, and Scriblio, SOPAC, VuFind to evaluate their

capabilities in next-generation library cataloguing systems. Two discovery tools, Collective Access and INSPIRE Discovery, were excluded from this study due to their limited library use. The eight tools were selected based on their relevance, popularity, and ongoing use in academic libraries. The primary reason for selecting these eight tools is their established presence in the field and active developer and user communities, ensuring continuous improvements and integration with modern technologies. Libraries around the world frequently reference and use these tools, making them essential resources. These tools have diverse features, technical architectures, community support, and comprehensive analyzing the open-source discovery landscape.

5 Resource Discovery Tools

Over the past few years, open-source integrated library management systems (ILMS) software has driven the demand for web-scale resource discovery systems (WSDSs), shifting the focus from library automation to resource discovery. These tools will provide unified access to content harvested from various sources, but not limited to libraries. Library professionals like these tools for their Google-like search experience and OPAC like beauty to retrieve precise information. However, libraries use diverse automation and digital repository systems with distinct standards, software, and retrieval methods. This generates different retrieval silos, forcing users to travel to various platforms and interfaces, making it impossible to search all resources from one location. Usually, next-generation catalogues change and repackage data from an integrated library system to check for mistakes, missing information, and problems with catalogue data in ways that regular web catalogues cannot perform, according to Wynne and Martha (2011).



This section discusses key findings regarding the eight widely used open-source discovery tools (Table 1). These tools can elevate the current cataloguing services provided by library automation systems to a higher level.

Table 1: List of considerable resource discovery tools

Name	Developer	Feature
Blacklight [https://projectblacklight.org]	University of Virginia Library and was first released on July 31, 2009	open-source under GNU -GPL with Apache 2.0 license, use Apache Solr as text retrieval engine, Ruby on Rails Engine provides discovery interface.
eXtensible Catalog (XC) [https://www.drupal.org/node/499770]	University of Manchester River Campus Library was introduced by the Andrew W. Mellon Foundation in 2004.	Its user -friendly interface connects with the University's ILS to simplify the access of resources.
Fac-Back-OPAC (Faceted Backup OPAC) [https://www.infotoday.com/cilmag/oct07/Beccaria_Scott.shtml]	renamed 'Kochif' in 2009, was developed by Casey Durfee and Dan Scott, and was initially developed for the Seattle Public Library	published under the Apache 2.0 license
LibraryFind [https://blog.reeset.net/groups/libraryfind]	Oregon State University Libraries (January 2007)	a hybrid federated search system and meta -search service, available with Ruby on Rails applications, and MySQL.
Rapi [https://web.archive.org/web/20140622101917/http://linc.comp.nus.edu.sg/code/#version]	the School of Computing at the National University of Singapore's WING project group	open source under the MIT license, use Lucene as text retrieval engine, Unicode and web 2.0 compatible, supports MARC 21 family of standards
Scriblio [https://web.archive.org/web/20080705083209/http://about.scriblio.net/download]	developed by Casey Bisson at Plymouth State University, and based on WordPress	open-source, integrates the OPAC interface into the WordPress CMS, provides faceted searching and browsing, making Google like single-window interface
SOPAC (Social Online Public Access Catalogue) [https://www.drupal.org/project/sopac]	Josh Hadro at the Darien Library, Connecticut.	retrieves records from an ILS through a connector, organizes the documents in a distinct engine, and presents a fresh user interface in Drupal CMS
VuFind [https://vufind.org/vufind]	Villanova University	Use Solr as text retrieval engine, stores USMARC data exported from any ILS in XML format, it possesses an OAI -based harvesting module based on OAI-PMH 2.0

6. Selection of Parameters

A comparative study of eight open-source library discovery tools is compared under two tables. The first table compares two distinct features such as search-enhancing

features (single-window search, central index/federated search, state-of-the-art web interface, enriched content, faceted navigation, keyword search, RSS feed generation, integration with social networking sites and persistent links, etc.);



standards support (METS, MODS, Z39.50, SRU/SRW, citation generation, OAI-PMH, NCIP Toolkit, ILS-DI support, favourite list, FRBRized display and Unicode, etc.); and another table compared with basic functional

modules of library automation in housekeeping operation (OPAC, cataloguing, circulation, and report generation). The primary criteria for inclusion within these fundamental groups are as follows:

Table 2: Grouping the considerable parameters

Group name	Parameters
1. Search enhancing features	<ul style="list-style-type: none"> ● Single-window search ● Enrich Content ● Faceted navigation ● Basic and advanced search ● Faceted results ● RSS Feeds/search alerts
2. Standards support	<ul style="list-style-type: none"> ● Metadata Encoding Transmission Schema (METS) ● Z39.50 Information Retrieval Protocol ● Functional Requirement for Bibliographic Records (FRBR) ● Interoperability and Crosswalk ● Unicode ● OAI/PMH ● ILS-DI
3. The functional module of library automation in housekeeping operation	<ul style="list-style-type: none"> ● Tag cloud search/limit interface ● Seamless integration of different metadata schema ● Record uploading for technology staff and/or catalogers ● RDA compliance ● Lists & Cart ● Full-text extractor / searching ● Hyperlink to a search result ● String search ● Sorts and displays search results ● Check-in a more precise search algorithm ● Left-anchored browse search ● Tracking usage ● Holds awaiting pickup ● Custom Reports ● Acquisitions ● Catalogue ● Circulation ● Statistics ● Serial management



7. Analysis and Discussion

performance of each chosen software using a 20-point scale.

The comparative findings are presented in two distinct sets. Set 1 evaluates the

A comparative analysis has been

Table 3: Represents the new innovative features, such as search-enhanced features and standard support tools

Sl. No.	Features		Open Source Library Discovery Tools															
			Blacklight		eXtensible Catalog		Fac-Back-OPAC (Kochief)		LibraryFind		Rapi		Scriblio		SOPAC (Social Opac)		VuFind	
	Group	Parameter	Support	Score	Support	Score	Support	Score	Support	Score	Support	Score	Support	Score	Support	Score	Support	Score
1	Search and Enhanced search features	Single-window search	Yes	1	Yes	1	Yes	1	Yes	1	No	0	Yes	1	Yes	1	Yes	1
2		Central index / Federated searching	Yes	1	Yes	1	Yes	1	Yes	1	No	0	Yes	1	Yes	1	Yes	1
3		State-of-the-art web interface	User interface only	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1
4		Enriched Content (cover image, reviews, book reader, previews etc.)	Cover image only	1	Yes	1	Yes	1	Yes	1	No	0	Yes	1	Yes	1	Yes	1
5		Faceted Navigation (Standard features)	No	0	No	0	No	0	Yes	1	Yes	1	Partial	0.5	Partial	0.5	Yes	1
6		Keyword search with a link to advanced search	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1
7		RSS feed generation for query	Yes	1	No	0	Yes	1	Yes	1	No	0	Yes	1	Yes	1	Yes	1
8		Integration with social networking sites	Yes	1	No	0	No	0	No	0	No	0	Yes	1	Yes	1	Yes	1
9		Persistent link to records	No	0	Yes	0	No	0	Yes	1	No	0	Yes	1	Yes	1	Yes	1
10	Support for standards	METS (Transmission XML Schema)	Yes	1	Yes	1	Yes	1	No	0	No	0	Yes	1	Yes	1	Yes	1
11		MODS	Yes	1	No	0	Yes	1	No	0	No	0	Yes	1	Yes	1	Yes	1
12		Z39.50	Copy cataloguing	1	Yes	1	Yes	1	Yes	1	Yes	1	1	0	Yes	1	Yes	1
13		SRU/SRW	Partial	0.5	Yes	1	No	0	Yes	1	No	0	Yes	1	Yes	1	Yes	1
14		Citation generation (by standards)	No	1	No	0	No	0	partial	0.5	Yes	1	No	0	Partial	0.5	Yes	1
15		OAI - PMH	Harvesting	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1
16		NCIP Toolkit	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1
17		ILS-DI support for real-time item-level status	No	0	No	0	No	0	No	0	No	0	No	0	No	0	Yes	1
18		Favorites list	Partial	0.5	No	0	No	0	Partial	0.5	No	0	Yes	1	Yes	1	Yes	1
19		FRBRized display of retrieved records	Entity/attributes	1	Yes	1	Yes	1	No	0	Yes	1	Yes	0	Yes	1	Yes	1
20		Unicode	Multilingual	1	Yes	1	Yes	1	Yes	1	No	0	Yes	0	Yes	1	Yes	1
		Total	16		12		13		14		08		14.5		18		20	



conducted on eight open-source discovery tools, using the values 1 for presence, 0 for absence, and 0.5 for partial presence. Table 3 represents the new innovative features, such as search-enhancing features and standard support solutions in discovery tools. The total score of VuFind is 20 out of 20 based on meta-search solutions and Web 2.0 features. The score of other discovery tools is Blacklight scored 16 out of 20, eXtensible Catalog (XC) scored 12 out of 20, Fac-Back-OPAC

(Kochief) scored 13 out of 20, LibraryFind scored 14 out of 20, Rapi scored 08 out of 20, Scriblio scored 14.5 out of 20, SOPAC (Social OPAC) scored 18 out of 20, VuFind scored 20 out of 20. In conclusion, VuFind is the most comprehensive open-source discovery tool compared to all open-source discovery tools.

Set 2 likewise evaluates the performance of each chosen software program using a 20-point scale and the same value system.

Table 4: The functional modules of library automation in housekeeping operations and information retrieval, including OPAC

Sl. No.	Features		Open Source Library Discovery Tools															
			Blacklight		eXtensible Catalog		Fac-Back-OPAC (Kochief)		LibraryFind		Rapi		Scriblio		SOPAC (Social Opac)		VuFind	
	Group	Parameter	Support	Score	Support	Score	Support	Score	Support	Score	Support	Score	Support	Score	Support	Score	Support	Score
1	OPAC	Tag cloud search/limit interface	Yes	1	Yes	1	Yes	1	No	0	Partial	0.5	Yes	1	No	0	Yes	1
2		Seamless integration of different metadata schema	Yes	1	Yes	1	Partial	0.5	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1
3		Record uploading for technology staff and /or catalogers	Yes	1	Yes	1	Yes	1	Partial	0.5	Yes	1	Yes	1	Yes	1	Yes	1
4		RDA compliance	No	0	Yes	1	No	0	Partial	0.5	No	0	Partial	0.5	Yes	1	Yes	1
5		Lists & Cart	Yes	1	No	0	Yes	1	No	0	No	0	Yes	1	Yes	1	Yes	1
6		Full-text extractor	No	0	No	0	No	0	No	0	No	0	No	0	No	0	Yes	1
7		Full-text searching	No	0	No	0	No	0	No	0	No	0	No	0	No	0	Yes	1
8	Cataloguing	Hyperlink to a search result	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	No	0	Yes	1	Yes	1
9		String that would be searched	No	0	Partial	0.5	No	0	Yes	1	No	0	No	0	Yes	1	Yes	1
10		Sorts and displays search results	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1
11	Circulation	Checking a more precise search algorithm	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	No	0	Yes	1
12		Left-anchored browse search.	No	0	No	0	Yes	1	No	0	No	0	Yes	1	Yes	1	No	1
13		Holds awaiting pickup	Yes	1	No	0	No	0	Yes	1	No	0	Yes	1	Yes	1	No	1
14		Tracking usage	Partial	0.5	No	0	Partial	0.5	Yes	1	Partial	0.5	Partial	0.5	Yes	1	No	1
15	Report Generation	Custom Reports	No	0	No	0	Partial	0.5	No	0	No	0	No	0	Yes	1	No	0
16		Acquisitions	Yes	1	Partial	0.5	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1
17		Statistics	Yes	1	Yes	1	No	0	No	0	No	0	No	0	Yes	1	Yes	1
18		Catalog Statistics	Partial	0.5	Partial	0.5	No	0	Partial	0.5	No	0	No	0	Yes	1	Yes	1
19		Circulation	Yes	1	No	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	No	1
20	Serials Statistics	Yes	1	Partial	0.5	No	0	No	0	No	0	No	0	No	0	Yes	1	
Total			13		10		10.5		10.5		08		11		15		19	



Table 4 shows that the functional modules of library automation in housekeeping operations and information retrieval include OPAC (Online Public Access Catalogue), cataloguing, circulation, and report generation. The score of discovery tools is Blacklight scored 13 out of 20, eXtensible Catalog (XC) scored 10 out of 20, Fac-Back-OPAC (Kochief) scored 10.5 out of 20, LibraryFind scored 10.5 out of 20, Rapi scored 08 out of 20, Scriblio scored 11 out of 20, SOPAC (Social OPAC) scored 15 out of 20, and VuFind scored 19 out of 20.

From the above discussion, Tables 3 and 4 demonstrate that VuFind is the best and most flexible open-source discovery tool, offering features such as a range of search and enhanced features, a collection of standard support tools, and various functional modules for library housekeeping operations. It also does better than others in both innovative and functional tests.

8. Conclusion

The concept of a 'Next Generation Catalogue' and search technology has combined to provide discovery tools with Google-like search capabilities for libraries. The difficulty that libraries face is making an informed choice regarding a tool tailored to their particular requirements and devising a plan for putting it into action and improving it to achieve their objectives. VuFind has better user interfaces and functionalities than other Next Generation Catalogue choices. The significance of this research is that it provides libraries with practical knowledge, enabling them to make informed decisions about discovery tools. The higher performance of VuFind highlights its potential for wider adoption. It further improves the user experience by providing a unified search platform that interfaces with various resources. This research work may help users of the libraries of colleges, universities, and

other academic institutions. This comparative investigation is a dynamic and progressive contribution to the LIS field, particularly library discovery. The study highlights the transformation of the current multi-point retrieval (silos) model in an academic library into a single-window discovery process.

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