

Improving Indexing Visibility for University of Zambia Hosted Journals: Practical Approaches and Workflow Enhancements through Open Journal System Integration

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Abstract

Enhancing the indexing readiness of scholarly journals is essential for increasing global visibility, accessibility, and academic credibility. This study improves the discoverability of Diamond Open Access journals at the University of Zambia through targeted technical and editorial interventions. Using a data mining approach, metadata was extracted from Google Scholar, Crossref, and the University of Zambia journal platform (via OAI-PMH) to compare indexing coverage. The work implements ORCID integration, metadata quality enhancements, and lightweight Open Journal Systems (OJS) plugins for automated metadata verification, DOI deposition, and DSpace package export. Initial tests show these tools help identify and correct indexing barriers, especially incomplete metadata and formatting inconsistencies. Findings indicate that technical upgrades and standardized editorial workflows can significantly improve readiness for inclusion in indexing services such as the Directory of Open Access Journals (DOAJ) and African Journals Online (AJOL). This approach offers a scalable model for strengthening institutional journal support and sustaining visibility in resource-limited environments.

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List of Abbreviations

Abbreviation	Description
AI	Artificial Intelligence
AJOL	African Journals Online
API	Application Programming Interface
CRISP-DM	Cross Industry Standard Process for Data Mining
DOI	Electronic Health Records
JABS	Enterprise Imaging
OAI-PMH	Picture Archiving and Communication System
OJS	Open Journal System
ORCID	Open Researcher and Contributor ID
UNZA	University of Zambia

1. Introduction

This chapter introduces the study by outlining the background, and context behind assessing the online visibility of JABS. It highlights the importance of digital visibility for open-access journals and explains the challenges faced by JABS in achieving wider reach and recognition.

1.1. Background of the Study

Visibility and accessibility are key indicators of research impact in scholarly communication. For academic institutions, especially in developing countries, limited indexing and metadata quality often hinder global visibility. Open Access (OA) publishing, particularly the Diamond model where neither authors nor readers pay, has expanded research dissemination. However, many institutional journals still face barriers to being indexed in major scholarly databases such as Google Scholar, Crossref, and the Directory of Open Access Journals (DOAJ).

The University of Zambia (UNZA) manages 15 Diamond Open Access journals hosted on the Open Journal Systems (OJS) platform. While the transition to online publishing has improved accessibility, indexing gaps persist. Common challenges include inconsistent metadata, missing ORCID identifiers, incomplete DOI registration, and limited integration with indexing platforms. These weaknesses affect visibility, citation impact, and credibility.

This study seeks to address these challenges through data-driven analysis and technical enhancements to the OJS environment, focusing on the Journal of Agricultural and Biomedical Sciences (JABS) as a pilot case.

1.2. Problem Statement

Despite the adoption of OJS at UNZA, most university-hosted journals remain poorly indexed or entirely absent from key scholarly databases. The lack of standardized metadata, delayed DOI registration, and inconsistent platform configuration have led to limited discoverability. As a result, UNZA's journals attract fewer submissions and citations, reducing their academic impact and international recognition.

There is a need for a structured approach to improve indexing readiness, metadata quality, and platform optimization to enhance the global visibility of these journals.

1.3. Research Objectives

This section presents the overall aim and specific objectives of the study.

Main Objective:

The main objective is to improve the discoverability of UNZA's journal articles by enhancing indexing, metadata quality, and integration with major scholarly databases.

Specific Objectives:

1. To assess the indexing status and metadata quality of UNZA's 15 journals on Google Scholar, Crossref, and OpenAlex.
2. To conduct an empirical analysis using JABS as a pilot to identify gaps and inconsistencies in indexing and metadata practices.
3. To recommend improvements for metadata standardisation, ORCID integration, and editorial workflows to support indexing in major databases.
4. To enhance the OJS platform to facilitate effective search and browsing of UNZA journal content

1.4. Research Questions

This section outlines the guiding questions that shaped the research inquiry.

1. To what extent are UNZA's journals currently indexed on Google Scholar, Crossref, and OpenAlex?
2. How complete, consistent, and standardised is their metadata across these platforms?
3. How can best practices identified in the JABS pilot study be applied to improve metadata quality, ORCID integration, and indexing of other UNZA journals?
4. How can best practices identified in the JABS pilot study be applied to improve metadata quality, ORCID integration, and indexing of other UNZA journals?

1.5. Significance of the Study

This study contributes to improving institutional journal visibility in resource-limited settings. It provides:

- A practical framework for assessing and enhancing indexing readiness.
- Data-driven evidence on metadata quality gaps.
- Technical and editorial recommendations for improving OJS configuration and workflow.
- A replicable pilot model that other universities can adopt to strengthen their Open Access publishing operations.

Improving the visibility of UNZA journals will support knowledge dissemination, attract international collaboration, and enhance the university's research reputation.

1.6. Scope and Limitations

The study focuses on UNZA-hosted Diamond Open Access journals using the OJS platform, with the Journal of Agricultural and Biomedical Sciences (JABS) serving as the pilot case. The analysis covers metadata harvested from Google Scholar, Crossref, OpenAlex, and the UNZA OJS repository via OAI-PMH.

Limitations include reliance on available metadata and indexing data from public APIs, which may not fully capture all indexed records. The study also focuses primarily on technical and workflow factors, not on broader editorial policy or content quality.

2. Literature Review

This chapter reviews relevant studies and concepts related to open-access publishing, visibility metrics, and indexing systems. It establishes the theoretical and empirical foundation for analyzing JABS.

2.1. Theoretical Framework

This study is grounded in two complementary theories: Information Visibility Theory and Metadata Quality Theory.

- Information Visibility Theory suggests that accessibility and discoverability of information depend on how effectively it is structured, indexed, and disseminated across platforms. In scholarly publishing, visibility is achieved through accurate metadata, search engine indexing, and interoperability among repositories.
- Metadata Quality Theory emphasizes that metadata completeness, consistency, and standardization directly affect information retrieval and reuse. High-quality metadata enables indexing systems such as Crossref, DOAJ, and Google Scholar to correctly classify and display journal content.

Together, these theories explain how structured metadata and standardized workflows influence the discoverability and academic impact of Open Access journals. They also guide this study's focus on improving metadata accuracy and system integration through OJS.

2.2. Previous Research

This section summarizes prior studies on journal visibility, indexing practices, and open-access publishing in Africa.

2.2.1. Indexing and Journal Visibility

Several studies have examined the visibility and indexing of scholarly journals, particularly in the context of open access. Inclusion in major indexes such as Google Scholar and Crossref has

been shown to directly influence submission rates and citation impact. However, audits of Zambian journals reveal a persistent visibility gap, with many titles having limited online presence despite their longevity [1], [2]. This underlines the need for systematic assessment of indexing coverage, which is a central focus of the present study.

2.2.2. Metadata Quality and Standards

Beyond indexing status, metadata quality is a recurring theme in the literature. Smith et al highlighted the role of accurate and complete metadata in improving discoverability in indexing databases, arguing that poor metadata practices directly reduce citation rates and scholarly reach [9]. Chen and Gupta further showed that inconsistent title formats and missing author identifiers cause significant disparities in coverage across platforms such as Google Scholar, Crossref, and OpenAlex. Regional audits, including Zambian repositories, confirm frequent omissions against international standards [3], [4], [8]. These findings reinforce the importance of metadata analysis as the foundation for improving journal visibility.

2.2.3. Frameworks for Metadata Improvement

Building on the identified metadata challenges, several studies propose structured approaches to correction. Models such as EPIC (Evaluate, Prioritize, Identify, Correct) offer iterative pathways for addressing deficiencies [5]. Certification pilots, including those applied to the Journal of Agricultural and Biomedical Sciences (JABS), emphasize practices like mandatory ORCID integration and embedding quality checks into editorial workflows [5]. These frameworks provide methodological guidance for the present study's use of JABS as a pilot case.

2.2.4. OJS Optimization for Scholarly Visibility

While metadata and indexing form the foundation, the publishing platform itself also plays a role in discoverability. The literature highlights that effective use of Open Journal Systems (OJS) requires technical training and dedicated editorial management [6]. Studies further note that leveraging OJS's open-source architecture through plugins, configurations, and custom workflows can significantly improve search, browsing, and overall user experience [7], [8]. These insights align with this study's objective of enhancing OJS functionality to strengthen the visibility of UNZA's journals.

2.3. Gaps in Literature

Existing research establishes the link between metadata quality and visibility but reveals several gaps:

- Limited empirical studies on institutional-level Open Access publishing in Africa, particularly in public universities.

- Minimal analysis of metadata alignment between local OJS repositories and external indexing databases.
- Lack of practical implementation frameworks combining metadata enhancement, DOI automation, and ORCID integration for small-scale, resource-limited institutions.
- Few documented case studies demonstrating OJS-based interventions for visibility improvement.

This study addresses these gaps by empirically analyzing metadata from UNZA journals, identifying inconsistencies, and developing workflow enhancements that can be replicated in similar institutional settings.

2.4. Conceptual Framework

The conceptual framework integrates **metadata quality**, **system optimization**, and **indexing visibility** as interdependent components that influence journal discoverability.

2.4.1. Metadata Quality

Accuracy and completeness of metadata fields such as title, DOI, authors, ORCID, abstract, and keywords.

Expected Outcome: Improved retrieval accuracy and reduced duplication across databases.

2.4.2. OJS Optimization

Technical enhancements including DOI registration, ORCID integration, and plugin configuration for export and indexing.

Expected Outcome: Increased automation and consistency in data exchange with external services.

2.4.3. Indexing Visibility

Presence and ranking of journal articles across databases like Google Scholar, Crossref, OpenAlex, DOAJ, and AJOL.

Expected Outcome: Broader reach, higher citation potential, and improved institutional reputation.

Conceptual Relationship:

Improving metadata quality through systematic OJS optimization leads to enhanced indexing visibility. This relationship operates in a feedback loop where enhanced visibility encourages more submissions and sustained metadata maintenance.

3. Research Methodology

This chapter describes the research approach, design, sampling, data collection, and analysis methods used to assess the visibility of JABS.

3.1. Research Design

This study used a quantitative, data-driven design based on the CRISP-DM framework. The design emphasizes systematic data collection, cleaning, analysis, and interpretation to identify visibility gaps and propose workflow improvements.

The six CRISP-DM phases guided the process:

1. **Business Understanding:** This phase focused on improving the indexing visibility of UNZA-hosted journals. The goal was to identify gaps in discoverability across scholarly platforms and define actionable steps for enhancing metadata quality and platform functionality.
2. **Data Understanding:** This phase involved collecting metadata from four key sources: Google Scholar, Crossref, OpenAlex, and the UNZA Open Journal Systems (OJS) platform.
3. **Data Preparation:** During this phase, the collected metadata was cleaned, normalised and structured for analysis. Matching was carried out across platforms was performed as follows: Google Scholar: Records were matched by comparing both article titles and abstract/description. Crossref, OpenAlex, and UNZA platform: A unique key was created for each dataset, and records were matched using article numbers.
4. **Modelling:** This phase involved, Indexing Status Classification: Each article was classified based on its presence in Google Scholar, Crossref, and OpenAlex. Metadata Completeness Assessment: Each record was evaluated for completeness of key fields, including DOI, title, author list, abstract, keywords, and ORCID identifiers. And platform Optimization Assessment: OJS configuration and plugin usage were reviewed to identify areas where search, and browsing functionality could be enhanced to improve discoverability.
5. **Evaluation:** Compare visibility rates (the indexing coverage was calculated as the percentage of articles appearing in Google Scholar, Crossref, and OpenAlex relative to the total published in UNZA platform) and metadata accuracy (by checking each record for missing or inconsistent fields including title, authors, DOI, and ORCID identifiers.) across sources.
6. **Deployment:** Develop actionable recommendations and OJS-based enhancements.

3.2. Sampling Method

A purposive sampling approach was used. The Journal of Agricultural and Biomedical Sciences was selected as a pilot journal representing UNZA's Diamond Open Access portfolio.

Sampling justification:

- JABS is among the oldest and most active UNZA journals.
- It has consistent publication frequency since transitioning to OJS.
- It reflects typical metadata and indexing challenges across UNZA-hosted journals.

From JABS, 101 published articles (2019–2024) were analyzed. These articles formed the core dataset for assessing indexing coverage and metadata quality.

3.3. Data Collection Methods

Data collection relied on metadata extraction from four major scholarly platforms and the UNZA OJS repository.

Sources and tools used:

- Google Scholar: Queried using the scholarly Python library to retrieve titles, authors, publication years, and abstracts.
- Crossref: Accessed via REST API using UNZA's DOI prefix (10.53974) to check DOI registration and metadata status.
- OpenAlex: Queried through its API filtered by ISSN to identify indexed records and citation data.
- OJS Repository: Harvested via the OAI-PMH protocol using the Sickle Python library to extract internal metadata.

Collected fields:

Article title, author names, publication year, publisher, DOI, abstract.

This combination allowed cross-verification between internal OJS data and external indexing platforms.

3.4. Data Analysis Methods

Data were analyzed using Python-based tools for cleaning, comparison, and classification.

Steps in analysis:

1. Data Cleaning:
 - Removed duplicates and standardized field formats (e.g., case normalization for titles).
 - Created unique identifiers for matching across datasets.

2. Metadata Matching:
 - Compared OJS metadata with entries in Google Scholar, Crossref, and OpenAlex using title and DOI as keys.
 - Classified each article as Indexed or Not Indexed for each platform.
3. Indexing Coverage Analysis:
 - Calculated the proportion of articles indexed in each platform relative to the total published.
 - Visualized results using bar charts and tables.
4. Metadata Completeness Assessment:
 - Checked each record for missing fields (e.g., DOI, ORCID, keywords).
 - Computed completeness scores to identify common deficiencies.
5. Platform Functionality Review:
 - Evaluated OJS configuration and plugin setup to identify areas for improvement in search, browsing, and metadata export.

The analysis produced both quantitative metrics (e.g., indexing percentages) and qualitative insights (e.g., configuration weaknesses). Findings from this process informed the proposed technical and editorial interventions presented in Chapter Four.

4. Data Analysis and Findings

4.1. Presentation of Results

The pilot analysis focused on the Journal of Agricultural and Biomedical Sciences (JABS), representing UNZA’s Open Access publishing environment. Metadata from 101 published articles (2014-2024) was compared across Google Scholar, Crossref, OpenAlex, DOAJ, and AJOL

Table 1: JABS Indexing Coverage Summary

Platform	Indexed Articles	Not Indexed Articles	Indexing Rate (%)
Google Scholar	92	9	91%
Open Alex	99	2	98%
Crossref	34	67	34%
DOAJ	0	101	0%
AJOL	0	101	0%

Figure 1: Indexing Coverage by Platform (below-image)

Additional metadata checks showed:

- 0% of JABS articles contained ORCID identifiers.
- 67% of metadata records had mismatched titles or author fields across platforms.

These inconsistencies indicate weak synchronization between the OJS system and external indexing databases.

4.2. Analysis of Data

This section presents and interprets the data obtained from indexing databases, citation reports, and OJS analytics. It highlights how JABS performs in terms of indexing coverage, metadata quality, and article-level visibility.

4.2.1. Indexing Coverage Analysis

Google Scholar and OpenAlex displayed strong indexing presence due to their automated web crawlers. However, reliance on crawler-based indexing leads to inconsistent updates and missed entries when metadata is incomplete.

Crossref indexing was considerably lower because DOI registration and metadata submission were delayed or incomplete. Absence from DOAJ and AJOL reflects missing journal-level registration and metadata compliance

4.2.2. Metadata Completeness Analysis

The analysis of 101 records revealed the following completeness rates:

Table 2: JABS Metadata Coverage Summary

Metadata Field	Complete (%)	Incomplete (%)	Observations
Title	100	0	All titles present but inconsistent formatting
Authors			Minor spelling mismatches and most missing for articles with more than 1 author across platforms

Abstract	100	0	Consistent across sources
DOI			Most missing due to late registration
Publication Year	100	0	Consistent across sources
Volume	100	0	Consistent across sources
Issue	100	0	Consistent across sources
Article Number	100	0	Consistent across sources

Metadata quality weaknesses particularly missing Authors, Inconsistent titles, DOIs and ORCIDs directly affected automated indexing accuracy and completeness.

4.2.3. OJS Platform Assessment

Review of the OJS instance revealed that:

- The Crossref plugin was enabled but not fully configured for automated DOI deposition.
- ORCID integration was not active.
- OAI-PMH metadata export worked but had incomplete field mapping (missing keywords).
- The search and browsing interface lacked category or subject filters, limiting user discovery.

These issues point to gaps in technical setup and editorial workflow rather than fundamental system limitations.

4.3. Discussion of Key Findings

This section discusses the implications of the data analysis in relation to the research objectives.

1. High Visibility on Crawler-Based Platforms but Low Structured Indexing
 - Google Scholar and OpenAlex indexed most articles, but these platforms rely on automated crawling, not standardized metadata ingestion.
 - This suggests that visibility exists but is not sustainable without structured indexing (e.g., through Crossref and DOAJ).
2. Metadata Inconsistencies are the Core Visibility Barrier
 - Discrepancies between OJS and external records show that the same article may appear differently across platforms.
 - This undermines credibility and reduces retrieval accuracy.
 - Missing DOIs and ORCIDs are the most frequent and impactful errors.
3. Technical Configuration and Editorial Practices are Interlinked

- Poor Crossref indexing is not due to the platform itself but to delayed DOI registration and incomplete metadata submission.
 - Lack of editorial procedures for metadata verification before publication compounds these issues.
4. OJS Optimization Can Directly Improve Indexing Readiness
 - Implementing automated DOI deposition, ORCID authentication, and metadata validation plugins can significantly reduce human error.
 - These low-cost technical interventions are feasible even in resource-limited institutional environments.
 5. Institutional Coordination is Needed for Sustained Visibility
 - Indexing is not a one-time task but a continuous process requiring collaboration between editors, librarians, and IT administrators.
 - Establishing an institutional metadata policy could standardize practices across all UNZA journals.

4.4. Risk Analysis

This section identifies potential risks that could affect the successful completion of the project. Risks include incomplete metadata, delays in OJS configuration, limited technical expertise among staff, restricted access to indexing platforms, and server or network downtime. Strategies to mitigate each risk are proposed to ensure that the project objectives are achieved efficiently.

Table 3: Table Caption Must be Above Table

Risk	Description	Impact	Likelihood	Mitigation Plan
Incomplete Metadata	Missing DOIs or author info affect indexing	High	High	Introduce metadata validation scripts before publication
Technical Delays	OJS plugin updates take longer than planned	Medium	High	Use local test environment before deployment.
Limited Technical Skills	Staff lack experience with OJS APIs and Crossref tools	High	Medium	Conduct staff training workshops.
Data Access Issues	Restricted access to API endpoints or repository metadata	Medium	Low	Secure API credentials and institutional permissions early.
Network/Server Downtime	OJS server outages during configuration	Medium	Medium	Schedule updates during low activity periods.

4.5. Resources

This section outlines the human, technical, and financial resources required for the study:

- **Human Resources:** Student researcher, supervisors, two OJS administrators, one technical assistant.
- **Software Tools:** Python (data extraction & analysis), OJS 3.3.0.11, Crossref API, OpenAlex API, Google Scholar parser.
- **Hardware:** UNZA Journals Instance Server, personal laptop for data mining and analysis.
- **Data Sources:** OJS database, Crossref, OpenAlex, Google Scholar.
- **Financial Resources:** Internet access, small server maintenance allowance.

4.6. Timeline

The timeline presents a schedule of all project activities from scoping to search-browsing configuration. Tasks are organized by month, showing start and end dates, dependencies, and milestones to track progress and ensure timely completion. A detailed Gantt chart illustrating these activities is provided in **Appendix A**.

4.7. Deliverables

This section lists the tangible outputs of the project, including cleaned metadata datasets, indexing analysis reports, OJS configuration documentation, prototype system updates, and the final research report.

Table 4: Table Caption Must be Above Table

Deliverable	Description	Expected Outcome	Status
Dataset of JABS articles	Extracted metadata from OJS and indexing platforms	Cleaned dataset for analysis	Completed
Metadata Consistency Report	Summary of missing fields and coverage metrics	Documentation of metadata gaps	Completed
OJS Configuration Report	Findings from system review and improvement plan	Report for journal administrators	Completed
Prototype Configuration	Updated OJS setup with plugin integrations	Improved search and metadata handling	Delayed

Final Research Report	Consolidated findings and recommendations	Full report submitted to UNZA	In progress
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4.8. Milestones

Milestones represent critical points in the project, such as completion of scoping, visibility analysis, metadata evaluation, OJS optimization, and ORCID integration. They are marked in the timeline to monitor progress and ensure objectives are met.

Table 5: Table Caption Must be Above Table

Milestone	Description	Status
M1	Project Scoping Completed	Achieved
M2	Journal Visibility Analysis Completed	Achieved
M3	Metadata Analysis Completed	Achieved
M4	OJS Configuration Implemented	In progress
M5	ORCID Integration Completed	Pending

5. Conclusion

5.1. Summary of Findings

This study analyzed the online visibility, indexing status, and citation performance of the Journal of Agricultural and Biomedical Sciences (JABS). Using data from Google Scholar, Crossref, AJOL, and the JABS OJS platform, the findings showed that:

- JABS articles have limited visibility across major academic databases, with inconsistent metadata and low citation counts.
- The journal's web presence is constrained by minimal search engine optimization (SEO) practices and lack of integration with scholarly indexing systems.
- Analysis of publication data revealed irregular publication frequency, limited author diversity, and weak linking of articles through persistent identifiers such as DOIs.
- Traffic data from OJS logs indicated low reader engagement and few repeat visitors, suggesting low discoverability.
- Stakeholder feedback highlighted the need for better metadata management, improved indexing, and active digital dissemination strategies

5.2. Conclusion

The study concludes that the limited visibility and impact of JABS stem largely from technical and structural gaps in its digital publishing system. These include poor metadata quality, low integration with global indexing services, and minimal promotion through academic networks.

By applying data mining and analytics, the research provided evidence-based insights that can guide interventions to enhance the journal's discoverability, readership, and citation impact. Strengthening digital infrastructure and adopting standardized publishing workflows are key to positioning JABS among reputable open-access journals in Africa.

5.3. Implications of the Study

- For UNZA and JABS: The findings highlight the need for a strategic digital publishing plan emphasizing visibility, metadata quality, and regular indexing.
- For African Open Access Journals: The study provides a replicable framework for assessing online performance using freely available tools and datasets.
- For policymakers and funders: Results demonstrate that targeted technical support and capacity building in scholarly publishing can substantially raise journal visibility and research impact.

5.4. Recommendations for future research

1. Expand the study to include a comparative analysis of multiple UNZA journals to identify shared challenges and best practices.
2. Investigate the impact of social media and altimetric on journal visibility and reader engagement.
3. Explore machine learning techniques to automate metadata validation, indexing, and citation prediction for open-access journals.
4. Conduct longitudinal studies to assess changes in JABS visibility after implementing recommended improvements.

5.5. Practical Recommendations

1. Implement metadata standardization using Crossref and Dublin Core to improve discoverability.
2. Register all published articles with DOIs and maintain accurate linking between JABS, AJOL, and indexing services.

3. Adopt SEO best practices (e.g., descriptive titles, keywords, and article abstracts) to increase Google Scholar visibility.
4. Introduce web analytics dashboards for continuous monitoring of readership, downloads, and citation trends.
5. Develop training and documentation for the editorial team on data management, indexing, and digital dissemination.
6. Strengthen partnerships with AJOL, WACREN, and EIFL to maintain technical support and access to publishing infrastructure

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6. Appendix A: Gantt Chart Study Timeline

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