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Strengthening Scholarly Publishing at the University of Zambia: Custom OJS Plugins for Metadata Accuracy, DOI Management, and Repository Integration

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***Abstract*— The growing demand for accurate, interoperable, and easily discoverable scholarly outputs necessitates enhanced publication workflows in institutional repositories and journal management systems. At the University of Zambia, where scholarly publishing is completely reliant on digital platforms, Open Journal Systems (OJS) has emerged as a central tool for journal hosting. However, limitations in automated metadata compliance, DOI integration, and repository deposition pose persistent challenges. This paper is guided by a quantitative data mining approach and presents the conceptualization, development, and deployment of three interlinked OJS plugins designed to enhance the publication pipeline: (1) an Automated Metadata Verification Plugin that validates journal article metadata against institutional and international standards (2) a DOI Deposition Plugin that streamlines Crossref DOI registration and metadata syncing in real time; and (3) a DSpace Export Plugin that packages OJS-published content into DSpace-ready simple archive bundles(e.g ZIP) for seamless repository ingestion. The proposed system is to be implemented and tested within selected UNZA-hosted journals especially under the JABS editorial workflow. Preliminary results from an empirical analysis show substantial improvements in metadata completeness, cross-platform visibility, and compliance with repository requirements. Additionally, the plugins promote FAIR (Findable, Accessible, Interoperable, Reusable) principles by ensuring structured and verified data flows across platforms. By automating routine tasks, reducing human error, and bridging siloed scholarly infrastructure, this plugin suite represents a scalable model for institutions seeking to align with international open access standards. The paper concludes with insights on customization for multilingual metadata, and roadmap plans for integration with institutional repositories.**

Keywords—Diamond Open Access, plugins, Metadata, Open Journal Systems

INTRODUCTION

The digital shift in scholarly publishing has transformed how universities produce, share, and preserve research, making accurate, interoperable metadata critical to visibility and impact. At the University of Zambia (UNZA), Open Journal Systems (OJS) is the main journal platform, yet faces persistent challenges in metadata quality, DOI registration, and repository integration, issues common across African institutions where workflows remain manual, inconsistent, and fragmented.

This research develops and deploys three modular OJS plugins to address these gaps:

- Automated Metadata Verifier: This plugin ensures standards-compliant, complete, machine-readable metadata.
- DOI Depositor: Enables real-time DOI registration and Crossref synchronization [4].
- DSpace Exporter: Packages content for seamless ingestion into UNZA's repository.

An analysis of three UNZA-hosted journals (JABS, JONAS, JLSS) revealed incomplete metadata, low indexing, and inconsistent global coverage, underscoring the need for automated, FAIR-aligned solutions. By reducing errors, bridging systems, and improving discoverability, the plugin suite strengthens UNZA's publishing infrastructure and offers a scalable model for enhancing the visibility and impact of African research.

BACKGROUND

The University of Zambia (UNZA) has long served as a leading academic institution in Southern Africa, producing research across diverse disciplines. In 2019, UNZA undertook a strategic transition from print-based scholarly publishing to digital platforms, adopting Open Journal Systems (OJS) as its primary journal management system. This move aligned with global trends toward open access and digital dissemination, offering the potential to streamline editorial workflows, improve accessibility, and enhance the visibility of institutional research.

Currently, UNZA hosts fifteen journals on its OJS platform, spanning fields such as agriculture, law, biomedical sciences, and natural sciences. While the adoption of OJS marked a significant step forward, the transition has revealed persistent structural and operational challenges. Editorial workflows remain fragmented, with delays in peer review, publication, and indexing. Metadata quality is inconsistent, often lacking the completeness and standardization required for effective indexing in global databases. Moreover, the absence of formal editorial guidelines and standardized processes has led to variability in journal quality and discoverability.

These challenges are compounded by limited automation and integration across systems. For instance, DOI registration is not consistently implemented , and there is no direct linkage

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between OJS and UNZA's institutional repository (DSpace), resulting in siloed content and missed opportunities for long-term preservation. As a result, UNZA's journals struggle to meet international publishing standards and remain underrepresented in key indexing services such as DOAJ, AJOL, and Crossref.

Addressing these issues is critical not only for improving operational efficiency but also for elevating the global profile of UNZA's scholarly output.

OBJECTIVES

The primary objective of this research is to enhance the efficiency, interoperability, and discoverability of scholarly publishing at the University of Zambia by developing and evaluating a modular plugin suite for Open Journal Systems (OJS) that addresses metadata quality gaps, workflow inefficiencies, and repository integration challenges.

RELATED WORKS

Metadata Quality in Digital Repositories: A Survey of the Current State of the Art

Park's study provides a critical examination of metadata quality issues in digital repositories, emphasizing the foundational dimensions of accuracy, consistency, completeness, and interoperability[1]. These dimensions are essential for ensuring that digital resources are discoverable, accessible, and preserved over time. Accuracy pertains to the correctness of metadata values, such as proper spelling, formatting, and semantic clarity. Completeness involves the inclusion of all necessary metadata elements, which is vital for effective indexing and retrieval. Consistency refers to the uniform application of metadata standards across records, while interoperability ensures that metadata can be exchanged and understood across different systems and platforms. Park's survey reveals that these dimensions are frequently compromised due to a range of challenges, including human errors in manual metadata entry, inconsistencies in applying standards like Dublin Core, and the absence of automated validation tools to enforce quality control.

Custom OJS Metadata Extractor

In light of the many inconsistencies in metadata quality in many repositories such as those presented by parks, one notable cause is human error[1]. In this light the The Rizqi et al. plugin[2] directly responds to the operational challenge of manual metadata entry within the OJS workflow, a process that, while systematic, is notoriously error-prone, inconsistent, and time-consuming. This is especially acute for non-native English-speaking contributors, multidisciplinary editorial boards, or institutions with limited technical staff of which the latter is the case for the University of Zambia. Manual metadata entry introduces not only a cognitive burden on authors and editors but also increases the risk of metadata inaccuracy and inconsistent adherence to schema standards (e.g., Dublin Core, NLM XML, JATS). These lapses can undermine discoverability, impact indexing in systems like Google Scholar or Web of Science, and compromise the downstream integration of research outputs [3].

METHODOLOGY

This study adopts a quantitative data mining and empirical analysis approach guided by the Cross-Industry Standard Process for Data Mining commonly referred to as the CRISP-DM framework[5].

Business Understanding

In the business understanding phase, the focus was on improving the indexing visibility of UNZA-hosted journals.

Data Understanding

The data understanding phase involved collecting metadata from four key sources: Google Scholar, Crossref, OpenAlex, and the UNZA Open Journal Systems (OJS) platform.

The data collection process used a range of Python tools. The *scholarly* library was applied to query Google Scholar by journal name and acronym, retrieving titles, authors, year of publication, citation counts, links, and abstracts. Crossref metadata was obtained via the REST API using the UNZA DOI prefix (10.53974). OpenAlex records were harvested using API queries filtered by ISSN. Metadata from the UNZA OJS platform was accessed through the OAI-PMH protocol using the *Sickle* library.

Data Preparation

During data preparation, metadata records were extracted, cleaned, and normalised. Matching was carried out using normalised titles and author names to align records across different platforms.

Modeling

Modelling involved the classification of indexing status for each article and the assessment of metadata completeness based on the presence of DOIs, titles, authorship, abstracts, keywords, and ORCID identifiers

Evaluation

In the evaluation stage, two analyses were conducted: firstly indexing rate comparison; the indexing coverage wascalculated as the percentage of articles appearing in each database compared with the total published in OJS. Secondly, metadata completeness was assessed by checking for missing or inconsistent fields.

Deployment

The deployment phase, still in progress, will use these results to guide workflow changes, editorial guidelines, and platform configuration improvements.

PRELIMINARY FINDINGS AND DISCUSSION

To guide the plugin development process, an empirical analysis was conducted to assess the current levels of online visibility, metadata completeness, and indexing of journals hosted on the University of Zambia's OJS platform. The three

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journals, out of the fifteen under review namely; JABS (Journal of Agricultural and Biomedical Sciences), JONAS (Journal of Natural and Applied Sciences), and JLSS (Journal of Law and Social Sciences) were analyzed using a combination of automated data mining tools and manual verification.Metadata was extracted using the following tools and services:

Google Scholar via the scholarly Python package
Crossref via its official RESTful API[4]
OAI-PMH endpoints of the institutional OJS platform using the sickle library
OpenAlex Queried articles by ISSN using OpenAlex API.

Public databases such as DOAJ, AJOL, and Archive Scholar were manually checked for inclusion. This quantitative analysis allowed for a comparative assessment of the discoverability and indexing footprint of each journal. The results revealed significant gaps and inconsistencies across repositories:

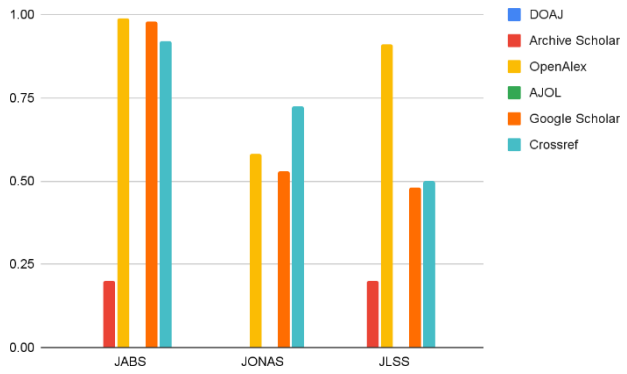

Fig.1 Online visibility of JABS, JLSS and JONAS

KEY OBSERVATIONS

No journal was indexed in DOAJ or AJOL, two of the most significant open-access directories relevant to African scholarship. JABS demonstrated the highest integration with Crossref (91.95%) and OpenAlex (99%), yet had a moderate presence on Google Scholar (48%) and was entirely absent from DOAJ and AJOL. JONAS had the weakest overall indexing performance, being unlisted in DOAJ, AJOL, and Archive Scholar, with limited visibility in OpenAlex and Google Scholar. JLSS showed relatively strong OpenAlex presence (91%) but lagged in Crossref coverage (50%) and was absent in DOAJ and AJOL.

These findings highlight the fragmented nature of metadata dissemination across platforms, which undermines the journals' visibility, citation impact, and compliance with FAIR publishing practices. The lack of standardized, machine-readable metadata especially regarding authorship, affiliations, and licensing was a recurring limitation, often attributed to inconsistent editorial workflows and manual errors.

This empirical evidence directly informed the design and prioritization of the three proposed plugins. It demonstrated an urgent need for automated metadata verification against institutional and international standards, DOI registration synchronization with Crossref to maintain real-time accuracy and structured packaging for institutional repository ingestion via Dspace.

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KEY DELIVERABLES

The development of three new plugins for the University of Zambia's Open Journal Systems (OJS) is underway, guided by an iterative, data-driven software engineering approach. Each plugin aims to streamline a specific part of the journal's publishing workflow to improve efficiency and data integrity.

Automated Metadata Verification Plugin

This plugin is designed to enhance the quality and discoverability of published research by automatically verifying article metadata.

Objective: To ensure that article metadata complies with institutional, Crossref, and other indexing standards.
Problem: An audit of three journals (JABS, JLSS, and JONAS) revealed discrepancies in critical metadata fields, such as author names, affiliations, abstracts, and ORCID identifiers.
Solution: A new, modular plugin for OJS 3.3 will be developed to parse and validate submission metadata against a predefined schema. It will check for the presence of required fields, proper formatting, and XML compatibility to ensure readiness for export.

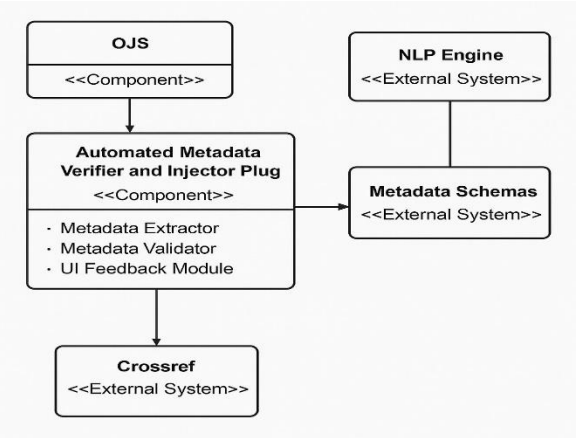

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Fig 2: Automated Metadata Verification Component Diagram

DOI Depositor Plugin

This plugin aims to automate the process of registering Digital Object Identifiers (DOIs) with Crossref, ensuring consistency and real-time linkage.

Objective: To streamline and automate the deposition of article DOIs, particularly for legacy OJS versions, to eliminate delays and inconsistencies in the registration process.

Problem: An analysis of JABS and JLSS indexing rates (91.95% and 50%, respectively) and interviews with editors confirmed that manual DOI deposition was a significant bottleneck.

Solution: An import/export plugin will be developed to use the Crossref RESTful API and OAuth for authentication. The tool will generate compliant JSON payloads directly from OJS metadata and will support three deposition modes: manual, scheduled batch, and automatic on acceptance. The plugin will also provide a real-time status view for each article's DOI.

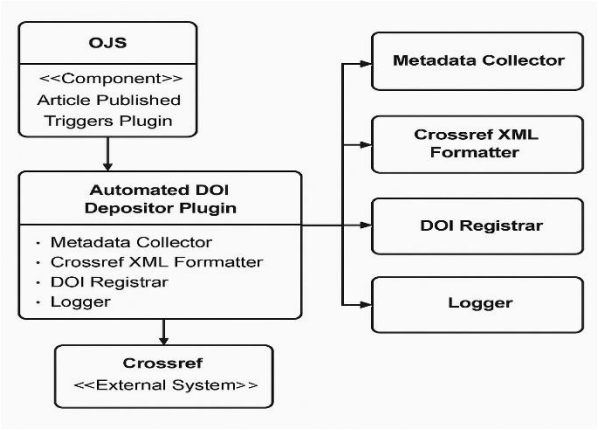

Fig 3. Doi Depositor Component Diagram

DSpace Exporter Plugin

This plugin is being created to simplify the process of transferring published content into the University's institutional repository.

Objective: To facilitate the seamless transfer of published journal content from OJS into institutional repositories like the University of Zambia's DSpace.

Problem: University Library staff reported that manually transferring content from OJS to DSpace is a time-consuming workflow prone to issues such as metadata duplication and content misalignment.

Solution: A generic plugin with a graphical user interface (GUI) will be designed to allow administrators to select published articles and export them as structured archive bundles ready for direct ingestion into the DSpace repository.

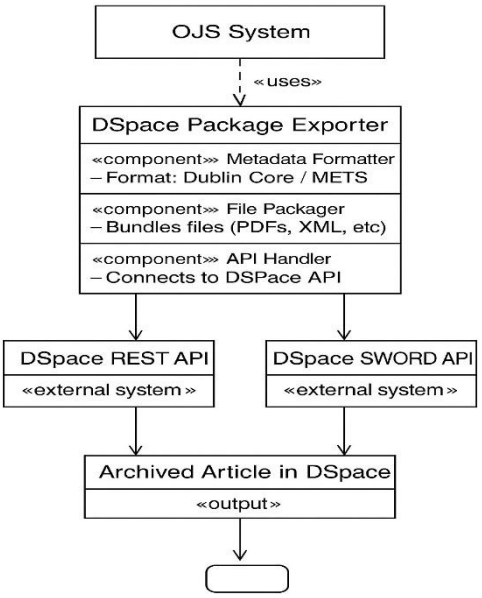

Fig 4. Dspace Exporter Component Diagram

CONCLUSION

This paper presents an ongoing initiative to enhance scholarly publishing workflows at the University of Zambia through the development of three interconnected OJS plugins focused on metadata verification, DOI deposition, and repository export. Preliminary analyses and early development efforts have highlighted key challenges in metadata quality, cross-platform integration, and repository ingestion that these tools aim to address.

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