Dealing with Multilingualism and Non-English Content in Open Repositories: Challenges and Perspectives

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Abstract: Several organizations and initiatives have recently called for more support of multilingualism in research to promote epistemic plurality and raise awareness of the adverse effects of an anglocentric research ecosystem. But this support for and practice of multilingualism and linguistic diversity cannot happen in a digital or technological vacuum. Open repositories can play an important role in ensuring that research infrastructures have the ability to implement and promote multilingualism at scale in an Open Science environment. This implementation, however, is complex and does not come without its own theoretical and technical challenges. One of these challenges is to recognize that the implementation of multilingualism in open repositories can hardly be dissociated from wider concerns of discoverability, research assessment practices, and the anglocentric nature of digital infrastructures and metadata standards or protocols. Drawing on the COAR (Coalition of Open Access Repositories) recommendations report produced by the COAR Task Force on Supporting Multilingualism and non-English Content in Repositories, this article presents and critically examines how and why three particular recommendations of this document are particularly well suited to support a decolonial trajectory for the management of multilingualism in open repositories. More specifically, this article discusses the decolonial aspects and praxis underlying guidelines such as declaring the language(s) of the resource and of its metadata, writing personal name/s using the writing system used in the deposited document while providing a persistent identifier to disambiguate author/s identification and, overlapping with the latter, enabling UTF-8 support so as to promote use of the original alphabet / the writing system whenever possible, without negating the possibility to transliterate metadata by means of recognized standards (e.g. ISO). In so doing, we argue that these recommendations enable a multifaceted technology and politics of recovery that promotes a form of linguistic revitalization and strengthens linguistic diversity.

Keywords: multilingualism, open repositories, linguistic revitalization, decolonization, epistemic diversity, discoverability

Advocacy for multilingualism in research has recently gained momentum, notably thanks to key reform- and policy-oriented texts related to Open Science and research assessment initiatives. The Helsinki Initiative on Multilingualism in Scholarly Communication (Helsinki Initiative 2019), the Call for Action to Foster Bibliodiversity in Scholarly Communications (Shearer et al. 2020), the UNESCO Recommendaiton on Open Science (UNESCO 2021), and the Agreement for Advancing Research Assessment (Science Europe and CoARA 2022), for example, all support multilingualism as necessary to help develop and maintain a diverse and qualitative research landscape. All of these texts suggest, albeit differently and in varying degrees, that the hegemonic status of English in research threatens bibliodiversity, hampers research innovation, and limits the development and significance of "locally relevant" research (Helsinki Initiative 2019).

While this defense for a gradual acceptance and improved recognition of multilingualism and non-English content in research is both timely and important for advancing equity, inclusivity, and social engagement in the global research landscape, it cannot happen without an enhanced discoverability capacity and the adoption of particular knowledge-sharing and archiving practices, let alone thrive in a global knowledge ecosystem that is increasingly digital, connected, and versed in dynamics of interoperability and semantic and linked data. Because of their community-oriented agenda setting and their ability to promote alternative circuits of publishing and knowledge dissemination (see Chan et al. 2019; Collyer 2018), open repositories and archives play an important role in defining and framing a knowledge-sharing and archiving praxis that improves the digital curation, management, and discoverability of multilingual or non-English content.

In August 2022, the Confederation of Open Access Repositories (COAR), an international organization aiming to build an "inclusive and trusted global knowledge commons based on a network of open access digital repositories" (COAR Confederation of Open Access Repositories, n.d.), launched a dedicated task force to develop and promote good practices for repositories in managing multilingual and non-anglophone content. In October 2023, the COAR Task Force on Supporting Multilingualism and non-English Content in Repositories published its recommendations document, which presents a series of guidelines and good practices based on the community input that the task force received after a public consultation. Eight recommendaitons on creating and curating metadata and six recommendaitons for repository software and platform developers were generated. They focus on declaring the language(s) of the resources and their metadata, using standard language codes, ensuring language specific user interfaces can be used, proper inclusion of personal names, using multilingual keywords, vocabulary and thesauri, and proper management of translated content.

The very nature and scope of these recommendations, just like their implementation, do not come without practical and theoretical challenges, especially as they

relate to linguistic marginalization and, more generally, decolonial perspectives on and about multilingualism and archival practices, both of which have a long-standing history with colonization and nation-building (see Carbajal 2021; Ghaddar and Caswell 2019; Gramling 2021; Ndhlovu and Makalela 2021; R'boul 2022a; Said 1979; Williams, Deumert, and Milani 2022). For example, digital architecture in general (Kwet 2019) and tools used to build digital archives such as open repositories have often been designed from a Western universalist perspective or unique ontology allegedly usable across different languages and cultures (see Chaka 2022; Filimowicz 2023; Graham and Dittus 2022). In fact, in most cases, English is the lingua franca for such systems and tools. This is not without posing serious technical issues in terms of flexibility as it can relate to the co-existence of languages and scripts. In a similar decolonial and postcolonial perspective, the metadata schemes and controlled vocabularies that are used to describe content in digital libraries and open repositories for enhanced discovery and interoperability purposes may not appropriately document Indigenous traditional knowledge and local languages or properly accommodate translated or multilingual content. The integration of multilingual keywords in open repositories, which could allow users to discover scholarly content in multiple languages, represents yet another challenge. For interoperability and discovery purposes, it should ideally be based on mapping strategies of common existing vocabulary schemes. But their ontologies are far from being equally inclusive to various cultural contexts, social groups, and languages (see Drabinski 2013; Howard and Knowlton 2018; Lacey 2018; Vaughan 2018).

In light of these numerous challenges, it is therefore important to further contextualize the COAR recommendations for the management of multilingual and non-English content through a decolonial critical lens, so as to reflect on their potentially decentering effects and inherent limits or tensions. It is, of course, beyond the scope of this article to discuss all of the recommendations of the COAR document in this perspective. The authors, who participated in the COAR task force, therefore identified particular recommendations to critically engage with in this article from a decolonial perspective in its broadest sense. These recommendations include declaring the language(s) of the resource and of its metadata; writing personal name/s using the writing system used in the deposited document while providing a persistent identifier enabling unambiguous author/s identification; and, overlapping with the latter, enabling UTF-8 support so as to promote use of the original alphabet or the writing system whenever possible, without negating the possibility, if necessary, to transliterate metadata by means of recognized standards (e.g., ISO).

The objectives behind our selection of these particular recommendations are manifold. From a visibility, discovery, and evaluation perspective, we argue that these recommendations can help foster a "balanced multilingualism," which considers that all forms and languages needed for all research purposes must be recognized and documented to

improve "the monitoring of further globalization of research" and ensure more diversity and equity in processes of research evaluation (Sivertsen 2018), while allowing better discoverability beyond default English settings of particular digital systems and architectures. Furthermore, we posit that this balanced multilingualism and the recommendations that it is built on can intimate what Kim Gallon calls "a technology of recovery" in exploring Black Digital Humanities (Gallon 2016)—that is, a conceptual framework which aims at recovering formerly marginalized voices and content through the use of digital platforms and resonates with the decolonial ethics of language reclamation theories and practices that place language revitalization and visibility beyond purely linguistic observations (Leonard 2012, 2017; Grenoble and Whaley 2021; Engman, Hermes, and Schick 2022; Filimowicz 2023). In the context of the management of multilingualism and non-English content in open repositories, it is important to note that this "technology of recovery," and its attendant politics, is predicated on the implementation of particular technical or strategic developments that run the risk of reproducing some of the politics of exclusion and marginalization, linguistic or otherwise, that are embedded in the very design and processes of research discovery platforms and archival practices.

To better understand and engage with the tensions underlying these overlapping objectives, it is therefore first useful and necessary to briefly contextualize the politics of multilingualism as they can be envisioned in the context of the geopolitics of knowledge dissemination and its attendant digital infrastructures. This is what the section below sets out to do without pretending to be exhaustive.

Literature Review

There is no denying that having a scientific lingua franca such as English "facilitates scientific mobility and . . . collaboration," just as it facilitates "international scientific communication" and "dissemination" (Steigerwald et al. 2022, 988). However, maintaining and supporting a monolingual research landscape has many disadvantages. It can be detrimental to global evidence synthesis and regional or community-oriented policy-making (Amano et al. 2021; Amano, Berdejo-Espinola, et al. 2023; Angulo et al. 2021; Konno et al. 2020). It can also reinforce the standardization and homogenization of research practices, as language is constitutive of how we perceive, explore, describe, and analyze the world (cf. Angulo et al. 2021; Hsu 2017; R'boul 2022b). Moreover, it places extra labor efforts and difficulties on non-English researchers, whose lack of language proficiency can lead to various gatekeeping effects—editorial or otherwise (cf. Amano, Ramírez-Castañeda, et al. 2023; Lillis and Curry 2010; Uzuner 2008). All in all, limiting the production and dissemination of knowledge to a common language can lead to various types of injustice and a lack of epistemological diversity, for which

sociologist Boaventura de Sousa Santos (2011, 2018) has coined the term "epistemicide" in his decolonial exploration of knowledge theory.

The inherent limits to knowledge diversity in the global research landscape have much to do with the Englishization of research, or rather with the promotion of English as a "standard for research visibility" (R'boul 2022a, 144), which concerns what is regarded, valued, and counted as knowledge or research. University rankings and what they are based on play a crucial role in this matter (cf. Ishikawa 2021; Morrison 2021; Robertson and Olds 2016; St. Clair 2021). In particular, the two major Anglocentric bibliographic and citations indexes used in many rankings and broader evaluation processes worldwide (Kulczycki 2023), namely the Web of Science (WoS) and Scopus, downplay the importance of "the contributions of universities beyond the Anglosphere" (St. Clair 2021, 133). Both indexes are indeed widely known for privileging anglophone content and journals (Vera-Baceta, Thelwall, and Kousha 2019; Tennant 2020; Khanna et al. 2022; Bardiau and Dony 2024). Vera-Baceta et al.'s study estimated the proportion of English content in Scopus and WoS at 92.64% and 95.37%, respectively (Vera-Baceta, Thelwall, and Kousha 2019, 1806). Though the scope of Scopus is admittedly more international (Baas et al. 2020), the selection processes of these indexes are particularly problematic in terms of linguistic diversity as both require that journals' article titles and abstracts be translated into English (see Clarivate, n.d.; Elsevier, n.d.), thus omitting non-Roman scripts and writing systems.

Researchers' and evaluators' heavy reliance on these commercial indexes, and on the metrics and rankings that they are based on (Collyer 2018; Ishikawa 2021; Kulczycki 2023; Morales et al. 2021; Robertson and Olds 2016), contributes to the subordination of non-English research in discovery tools and research evaluation processes (Mamdani 2019; St. Clair 2021; Schmidt 2020), despite the fact that the development of non-English research is still vibrant when looking beyond these indexes. For instance, it is well recorded that research in the social sciences and the humanities (SSH) is often "grounded in specific cultural or geographical areas" and therefore promotes "the persistence of native languages" rather than solely focusing on English (Giglia 2019, 143). This persistence of native or local languages in SSH research is attributed to various forms of social engagement with cultural and political concerns (Giglia 2019; Kulczycki et al. 2020; Luzón 2019), which can be considered to represent local and alternative hubs of knowledge. This is particularly true in light of the fact that multilingual publishing has also reportedly been presented as "an ongoing practice in many SSH research fields regardless of geographical location, political situation, and/or historical heritage" (Kulczycki et al. 2020, 1371). Moving beyond SSH, looking at multidisciplinary journals lists and digital libraries beyond traditional indexes such as Scopus and the WoS shows that the scholarly communications landscape embraces linguistic diversity and multilingual publishing more than is generally assumed. For example, a recent

study analyzing the 25,671 active journals employing the open-source publishing plat-form Open Journal Systems (OJS) reports that only 49.7% of journals were using English as a main language of publication (Khanna et al. 2022). Building on this study, Mikael Laakso and Janne Pölönen have attempted to map languages used in a global landscape made of 150,760 scholarly journals and reported the proportion of journals using English only at 47%, with journals using multiple languages at 19% (Laakso and Pölönen 2023). Open Access repositories and digital libraries also ensure the preserva-tion of much non-English and multilingual scholarly content beyond journal articles. As of December 6, 2023, for example, the Directory of Open Access Books (DOAB) indexed over 76,000 books with more than 30,000 books published in languages other than English (DOAB, n.d.). Similarly, in a recent Report on Repository Survey in Europe, it was shown that a majority of open repositories surveyed "collect content in at least two languages" (Shearer et al. 2023, 28), albeit with "either the main local lan-guage being most predominant, or second most predominant after English" (Shearer et al. 2023, 29). As of December 6, 2023, the recently launched open scholarly com-munications digital catalog OpenAlex (Priem, Piwowar, and Orr 2022) indexed more than 246,800,000 scholarly objects, of which over 74,000,000 (30%) are allegedly not in English.

This non-exhaustive list of examples attests to the sheer volume of multilingual and non-English content in digital libraries and repositories, most of which are part of a growing and multidimensional "alternative, open discovery infrastructure" that "builds on a network of tens of thousands of libraries, archives, repositories, and aggregators that offer their (meta-)data via an open data interface such as OAI-PMH" or similar metadata protocols (Kraker, Schramm, and Kittel 2021, 5). This growing open discov-ery infrastructure, with its multidimensionality and decentralized governance, can help us challenge a universalist and English-centered perception of the research ecosystem (cf. Chan et al. 2019), especially as currently defined in North America and Europe through the lens of traditional, yet somewhat outdated, commercial discovery indexes and metrics. Ensuring that research infrastructures have the ability to implement and improve the digital curation and discoverability of multilingual or non-English content *at scale* in an Open Science environment is of crucial importance in this respect. But paradoxically enough, there is very little guidance on how to tackle these questions and issues at scale, even if some very general guidelines (Diekema 2012; Wu and Chen 2022) exist, just like presentations of community-scaled and community-specific initia-tives or cataloging developments related to digital libraries and archives (see Concordia, Gradmann, and Siebinga 2010; Stiller et al. 2014; Matusiak et al. 2015; Riva 2022).

General guidelines and recommendations provided by Anne Diekema (2012) and Anping Wu and Jiangping Chen (2022) identify major challenges and obstacles for the management of multilingualism in digital libraries. Diekema's review primarily offers

a presentation of technical challenges as they can relate to technical aspects, including "data management (localization and language processing), representation (dealing with different fonts and character codes), development (creating international software, cross-cultural collaboration), and interoperability (system architecture and data sharing)" (Diekema 2012, 165). Drawing on the World Digital Library and the Digital Library of the Caribbean as case examples of successful multilingual libraries, Wu and Chen (2022) primarily focus on the organizational and operational obstacles needed to sustain multilinguality in these digital environments. They emphasize the need for partnership and collaboration as well as fundraising and budgeting capabilities to envision an ongoing and sustainable development and implementation of multilingualism in such environments. In the case examples studied, the authors highlight that fundraising and grants allowed the creation of particular digital library software and application software which helped meet the specific multilingual needs and objectives of these projects. Both studies, however, devote little attention to technical specifications and how they can convey a particular trajectory to multilingualism—ideological or otherwise.

Other studies have shown the importance of translating multilingual metadata schemes and keywords to allow for enhanced discoverability and to improve multilingual retrieval search functions for similar community-scaled or community-specific initiatives and projects (see Concordia, Gradmann, and Siebinga 2010; Stiller et al. 2014; Matusiak et al. 2015; Riva 2022), while sometimes also pointing to the possibility of crowdsourcing for doing so (Budzise-Weaver, Chen, and Mitchell 2012). Processes of participatory metadata and objects description for scaling up such endeavors have also been recommended (Haberstock 2020). Of particular interest in terms of research discoverability is the recent development of the GoTriple project, a European discovery platform for SSH which supports discovery in 12 languages thanks to an advanced approach of metadata enrichment that is based on a "hierarchical" and multilingual thesaurus of "over 3.300 SSH-related concepts in these 12 languages: Croatian, Dutch (partial), English, French, Finnish, German, Greek, Italian, Polish, Portuguese, Spanish, Ukrainian" (GoTriple, n.d.; see also Dumouchel et al. 2020). The structure of this vocabulary, however, can be criticized for perpetuating Western-oriented hierarchical and institutionalized logic of subject descriptions, which in this case heavily draws on the useful, yet in many regards contested, Library of Congress Subject Headings Classification (see Drabinski 2013; Howard and Knowlton 2018; Lacey 2018; Vaughan 2018).

While these works show that solutions retained for implementing multilingualism in digital archives and libraries are very much context-specific and that recommendations can hardly be imagined according to a prescriptivist logic, they mainly focus on providing insights on technical solutions, platform organization, or infrastructure sustainability. As a result, they usually fail to critically engage with how their proposed technical solutions or design enhancements may be at odds with the decentering logic of a decolonial

archival praxis, which "considers how archives emerge through multifaceted global processes and structures, and are embedded within larger discursive formations, in which multiple cultural sites, texts and contexts are active" (Ghaddar and Caswell 2019, 78). This, of course, may be due to the very dynamic and highly political character of multilingualism itself (cf. Ferrante, Bernstein, and Gironzetti 2019; Gramling 2021; Turner 2023), which remains a moving target and therefore requires ongoing re-evaluation (see Makoni, Kaiper-Marquez, and Mokwena 2022; McKinney, Makoe, and Zavala 2023).

Methods

As previously suggested, this article is grounded in several and intertwining lines of inquiry that draw on decolonial studies, Southern theory, scholarly communications, and digital and archival studies, all of which are used to critically engage with how the implementation of particular recommendations for the development of multilingualism and non-English content in open repositories can promote a balanced multilingualism and, at the same time, strengthen a technology and politics of recovery for non-English scholarly content in the global research ecosystem.

The central approach of this article is thus qualitative insofar as it aims to shed light on the (de)colonial realities and mechanisms underlying the recommendations presented here. In so doing, the present work can be located in the continuity of a growing body of archival and library-related scholarship that is concerned with diversifying, decentering, and decolonizing scholarly communications and research libraries (see Crilly 2023; Schmidt 2020, 2023).

Because the corpus of recommendations analyzed here is directly drawn from a specific document written by the COAR Task Force on Supporting Multilingualism and non-English Content in Repositories, it is also important to briefly present this task force and to draw the contours of its work, especially so given the topics at stake.

To ensure a diversity of perspectives, the task force was composed of a multiplicity of stakeholders (repository managers and translators, representatives of aggregating and discovery systems) coming from various countries (Argentina, Belgium, Canada, China, Ecuador, Germany, Japan, Nepal, Mexico, Peru, Serbia, Spain, Türkiye, Ukraine, and the United States). The task force, drawing on several use cases contributed from different stakeholder communities, identified three key areas to work on: enhancing discoverability of non-English content, curating multilingual content in a repository, and supporting translations. In June 2023, the task force released a preliminary set of draft suggestions for community feedback. The ensuing consultation yielded a diversity of perspectives which were examined before being integrated into the final recommendations document.

The consultation also revealed some limitations and challenges. These are prevailingly associated with technical issues: missing or insufficiently developed features in widely used repository software platforms, the lack of inclusive ontologies, and the lack of standards that would address the specific features of Indigenous cultures. We address some of these limitations as they apply to the particular recommendations discussed below.

Writing Systems and Names

Many use cases presented to the COAR working group involved issues concerning the ability to render text in a variety of writing systems without compromising discoverability, including questions revolving around transcription and transliteration practices and the ability to properly render names and other information (e.g., metadata) in non-Roman alphabets. This led the task force to develop a set of particular recommendations addressing these overlapping issues or parts thereof. These recommendations read as follows:

> Enable UTF-8 support in your repository and use the original alphabet/the writing system whenever possible. If it is necessary to transliterate metadata, use recognized standards (e.g., ISO).
>
> If the repository software supports multiple interface languages, set up the user interface in the native language(s) of the target group, along with the English option.
>
> Write personal name/s using the writing system used in the deposited document and provide a persistent identifier enabling unambiguous identification, such as ORCID. (COAR Task Force on Supporting Multilingualism and non-English Content in Repositories 2023)

These seemingly simple recommendations promote a type of balanced multilingualism that enacts what can be described as a technology and politics of recovery insofar as they improve the visibility of formerly marginalized voices and scripts in digital spaces without compromising discoverability, while enabling greater curation accuracy. To better understand how these intertwining issues underlie the above recommendations and how the latter *write back* to various forms of linguistic exclusion, it is useful to account for how technical limitations of text-rendering tools in both pre-digital and digital ages have historically affected cataloging practices and metadata curation in digital repositories, including the development of transliteration and transcription techniques as a response to these limitations.[1]

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1. Transliteration is the representation of characters of one alphabet using the characters of another; transcription is the representation of the pronunciation of a term in one language using the characters of the writing system of another language (ISO, n.d.-b).

The ability to use a language in a digital space is determined by the ability of technology to support the appropriate writing system. The key technology enabling multilingualism in the digital sphere is the Unicode encoding standard (Korpela 2006), which can support 161 scripts (Unicode, n.d.-b), and the UTF-8 variant of Unicode is currently the dominant encoding on the internet, with 98.1% of surveyed websites using it (W3Techs: Web Technology Surveys, n.d.). However, the early development of digital technologies and the internet was marked by the domination of the English language and ASCII (American Standard Code for Information Interchange) character set, which is suitable for English but does not contain any characters with accents or diacritics used in French, Scandinavian, and Slavic languages, let alone non-Roman characters (Nolan 2006). Digital technologies and devices designed in and for anglophone environments, with interfaces and supporting documentation in English and restrictive licenses hindering localization, set a linguistic barrier and led to the exclusion and marginalization of non-English-speaking users (Nolan 2006; Souphavanh and Karoonboonyanan 2005; Mikami and Shigeaki 2012; John 2013). This also limited the ability of non-anglophone communities, especially those not using the Roman alphabet, to express themselves and communicate in digital spaces, raising concerns that "digital colonialism" (Kwet 2019; Kupfer and Muyumba 2022) or "computer-mediated colonization" (Ess 2007) would create digitally disadvantaged languages—that is, languages which are inadequately supported by digital tools such as text processing software, keyboards, fonts, web browsers, OCR (optical character recognition) tools, assistive technologies, and so forth (Zaugg, Hossain, and Molloy 2022) and can eventually disappear as a result (UNESCO 2015).

The early versions of Unicode appeared in the early 1990s, but it took over a decade before it was implemented in widely used writing tools, cataloging and repository software, and general and scholarly information retrieval systems. Unicode has been presented as a means "to simplify software internationalization" (John 2013, 329; see also Souphavanh and Karoonboonyanan 2005) and is therefore claimed to function as "yet another instance of western cultural imperialism" (John 2013, 330). In the context of digital repositories, however, Unicode can be perceived differently as its wide adoption has functioned as a solid base for more digital inclusion and the recovery of "minority" languages. Unicode indeed took root in free and open-source repository software in the early 2000s thanks to liberal licensing practices (Souphavanh and Karoonboonyanan 2005), which enabled the development of localized and multilingual user interfaces; metadata input using various scripts; and, consequently, support for search strings in various languages and scripts.[2]

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2. Based on the software documentation, it seems that both DSpace and EPrints supported UTF-8 from the outset, though many fixes were required to make it work properly ("DSpace System Documentation: Version History" 2005; "DSpace Character Encoding HOWTO," n.d.; "Unicode" 2021).

Despite these technological prerequisites, the analysis of use cases presented to the COAR working group showed that encouragement to use their full potential is needed, hence the support for UTF-8 implementation in the COAR recommendation. Before the advent of Unicode and UTF-8 and their subsequent adoption in digital repositories, temporary fixes and workarounds for encoding and cataloging practices were developed, such as replacing non-supported characters with similar ASCII characters or with images, national encodings, and so forth (Korpela 2006; Hardie 2007; John 2013). And some of the use cases submitted to the task force revealed that some of these techniques tend to persist even after the emergence of technologies that provide more efficient support for multilingualism.

Transliteration and transcription are examples of such a workaround inherited from the pre-digital age. Similarly to translation (Shamma 2018), transliteration and transcription are in many cases associated with cultural hegemony—for example, Early Modern missionary dictionaries, translations and writings in vernacular languages printed in the Roman alphabet (Burke 2006; Kiaer et al. 2022; Liu 2018), or the use of first Latin and then Cyrillic for Turkic languages in the Soviet Union (Alpatov 2017). In the context of archival and library practices, transliteration and transcription are a staple of cataloging standards which respond to the need for a single authorized form of a personal name.[3] In the Global North, this single form has always been romanized; see, for instance, the ALA-LC romanization tables (Barry, Library of Congress, and American Library Association 1997) or ISO standards relating to the transliteration of different writing systems (ISO, n.d.-a).

This particular approach is arguably associated with the technical limitations of text-rendering tools and information retrieval systems which did not support multiple alphabets when the standards were defined. Paradoxically, however, this method has failed to ensure the desired unification due to the multiplicity of systems used for transliteration and transcription. Although disputed as inaccurate, expensive, and inefficient (Aissing 1995; Dagher and Soufi 2021), the practice of transliterating and transcribing names in repositories is still widespread for several reasons, including heavy reliance on transcription- and transliteration-friendly metadata standards such as DataCite's (n.d.), the persistence of traditional cataloging infrastructures and workflows, the substantial body of legacy metadata (inherited from the pre-digital age), and the fear that aggregators and retrieval systems will not be able to process non-Roman characters appropriately. Moreover, it is usually feared that target audiences in the Global North will not be able to decipher names in non-Roman alphabets. However,

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3. What makes matters even more complicated is that, in some languages, the transcription of personal names, proper nouns, and even loanwords is enshrined in the orthography and legislation (Hardie 2007; Klyshinsky, Maximov, and Yolkeen 2008; Naumova 2014).

most search engines can process various languages and scripts, even if risks exist that the ranking algorithms may favor anglophone content and the Roman alphabet in search results (Rovira, Codina, and Lopezosa 2021). Finally, some writing systems are still not encoded in Unicode (Unicode, n.d.-a), and multilingual support varies across infrastructures and tools. However, it is noteworthy that transliterated and particularly transcribed forms of names can make information retrieval more difficult because users are not necessarily aware of the transformations to which names are subjected in the curation process, some of which can also lead to information loss (Borgman 1997; Monyela 2021).

The COAR recommendation concerned with names tackles these intertwining issues at the technical level, releasing metadata curators from the burden of seeking for a single optimal authorized name form by either transliterating/transcribing it or by recovering its original spelling from the information provided in the publication. According to this recommendation, names in the repository metadata should accurately capture the spelling provided in publications, while disambiguation is to be ensured via unique personal persistent identifiers included in the metadata and linked to external services that store and maintain them (e.g., ORCID, ISNI, VIAF). The advantage of this approach is at least twofold. First, it ensures that content is discoverable regardless of the spelling in the search string. Second, it allows names to be displayed and processed as authors have chosen to render them in the publication.

To complement this approach, the second part of the UTF-8-related recommendation is also grounded in practical logic. It advises using the writing system of the resource whenever possible, even for metadata that cannot be associated with a persistent identifier (e.g., titles) so as to promote digital inclusion and improve curation accuracy while avoiding issues of comprehension that could surface from transliteration and transcription standards. Finally, the discoverability of content in non-Roman writing systems can additionally be supported by providing keywords in multiple languages, a possibility that is also addressed in the COAR recommendations.

Declaring Languages

Language declaration presents another challenge for multilingual scholarly content discovery. This is because if "the language of a scholarly resource is not labeled properly it will not be correctly indexed by discovery services. That is because indexing involves text analysis practices such as stemming, lemmatization (grouping together the inflected forms of a word so they can be analyzed as a single item), and the appropriate treatment of stop words. All of these text analysis techniques are very language

specific" (COAR Task Force on Supporting Multilingualism and non-English Content in Repositories 2023). Content aggregators and discovery systems therefore need to know the languages of full-text documents they index, so they can assist users in finding content in their preferred languages. Repositories and other content management systems therefore need to provide this information by declaring the languages of their resources at the item level and in the resource descriptions (i.e., metadata) to help information seekers and content aggregators, indexers, and discovery services to correctly identify the language of the full text, process the items accordingly, and offer better multilingual retrieval. By the same token, declaring the language(s) of a document and that of its metadata can help aggregators and discovery services display languages as filters or in search elements. In turn, this displaying of language(s) as constitutive of a resource can potentially pave the way for newer forms of research monitoring and evaluation, thereby actively contributing to the implementation of a more "balanced multilingualism" (Sivertsen 2018). This is also why if the resource (e.g., an edited volume) has important sections of the text in different languages, the language metadata must be repeated to mention each language.

The technical implications underlying the recommendation to declare the language(s) of a resource should not be overlooked as language is both a descriptive and technical characteristic of the resource and a significant property for long-term preservation that impacts rendering, behavior, interpretation, and accessibility of digital objects, together with other technical features such as file format, compression algorithm, software version, resolution, and color space. This is why the COAR report recommends that language is encoded as a significant property using particular metadata standards often employed together for preserving and managing digital objects, namely Preservation Metadata: Implementation Strategies (PREMIS) and the Metadata Encoding and Transmission Standard (METS). As noted in the report, "METS is primarily focused on encoding descriptive, administrative, and structural metadata, providing a framework for organizing and linking various types of metadata within a structured XML document. PREMIS, on the other hand, focuses on documenting the actions, events, and processes involved in the long-term preservation of digital objects. METS can serve as a container for various metadata, including PREMIS metadata, allowing for the integration of preservation-specific information within the broader context of digital object organization and description" (COAR Task Force on Supporting Multilingualism and non-English Content in Repositories 2023). This is why the report recommends that language is encoded as a significant property using PREMIS and considered to be technical metadata, significant for preservation. Language can also be embedded into the METS as technical metadata for text documents. In addition, language information, if considered as a descriptive characteristic of the intellectual content, can be embedded into the METS as descriptive metadata.

The language of the metadata elements, resource descriptions, should be specified as well for the same reasons as outlined above. Regardless of the fact that English is mainly assumed to be the standard for metadata fields, this content should also be exposed with a reference to the language used. It is worth doing it at the repository level as most content aggregators cannot infer language from the content of the metadata. Some aggregators, such as OpenAIRE, support the language tag and conduct metadata checks for languages in subjects, titles, and descriptions. However, there is no exposure of the language of metadata in the exchange protocol used by content aggregators and repositories, Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH). As a result, the report invites repository software developers to consider this in future versions of their platforms.

Various approaches are used by repository administrators and managers to declare the language, depending on the capacity of the repository software to handle this information. Some repository software, such as WEKO developed by the National Institute of Informatics, Japan, and based on INVENIO by CERN, allows adding a language attribute to any metadata as long as it is allowed in the supported Japan Consortium for Open Access Repositories (JPCOAR) metadata schema. In other cases, new versions of repository software enable language declaration; for example, new metadata enhancements on Open Science Framework (OSF) for all OSF Projects, Registrations, and Preprints now include the language of materials. Some other repository software should be customized; EPrints repository software can be extended to declare language information at the item or file level, but this is not in place on EPrints by default. Similarly, EPrints XML export plugins, embedded metadata, and OAI-PMH interface code could be extended to define xml:lang attributes, but it does not do this by default.

To ensure interoperability between different systems, and hence a better visibility and recognition of language attributes in a variety of platforms that make up the multidimensional alternative, open discovery infrastructure of the research ecosystem, the language metadata must be encoded using a standardized nomenclature to classify languages—the ISO 639 language code is the form of a two- or three-letter, such as "en" or "eng" for English. However, while the ISO 639 use is straightforward for well-known and widely spread languages (in January 2023 it included codes for over 7,900 languages), lesser-known languages and regional varieties or historical stages of languages may not be sufficiently represented in ISO 639. To solve this issue, the language code can be followed by optional subtags refining or narrowing the range of the encoded language in the following form: language-extlang-script-region-variantextension-privateuse with the "x" private-use subtag for the identification of language variations (as described in Gillis-Webber and Tittel 2020, 639). The COAR report includes a decision tree on how to determine a language tag.

Repository software provides multiple ways to implement these recommendations. For example, in DSpace 7 and later versions, the value-pairs set for languages can include any languages and language identifiers. By default, DSpace provides value-pairs for 10 languages: English (United States) (en_US), English (en), Spanish (es), German (de), French (fr), Italian (it), Japanese (ja), Chinese (zh), Portuguese (pt), and Turkish (tr). However, it is fully customizable and can include three-letter identifiers. During content submissions, language values are displayed as a drop-down list, while in the metadata editing mode, language is a free text field. There are also solutions to fix language code inconsistencies in repository platforms.

The implementation of these recommendations can be read as the decolonial action of reclaiming and reassigning value to non-English content via technical processes of localization and multilingual support in digital platforms, which were previously overlooked in the context of Anglocentric research and the allegedly universal character of digital infrastructures. It does require extra time and labor, but we believe that the benefits overweigh the costs insofar as they help to improve a diversity of various cultural contexts, social groups, and languages, thereby enabling epistemological diversity (see Santos 2011, 2018) and ensuring that more diversity and equity in research evaluation can be achieved through further fostering of a "balanced multilingualism" (Sivertsen 2018).

Conclusion and Next Steps

The promotion and advancement of multilingualism in research can hardly be decoupled from wider concerns of discoverability, research assessment and monitoring practices, and the anglocentrism of digital infrastructures and metadata standards or protocols. This is why engaging with these intertwining issues and debates is necessary in crafting and providing recommendations for the management of multilingual content in digital spaces. To put it differently, there can only be *ongoing trajectories* for the promotion and advancement of multilingualism in research and scholarly communications. In this article, we have presented and discussed how and why particular recommendations elaborated by a dedicated COAR task force instill a decolonial trajectory for the management of multilingual and non-English language content in open repositories. The decolonial aspects of this trajectory can be seen in how the curation practices and technical guidelines embedded in these recommendations enable a multifaceted technology and politics of recovery that promote a form of linguistic revitalization (see, e.g., O'Grady 2018; Grenoble and Whaley 2021; Olko and Sallabank 2021) as well as strengthen linguistic diversity and, eventually, epistemic plurality.

Processes akin to linguistic revitalization and other practices enabling the disruption of the existing Anglocentric research ecosystem obviously go well beyond open

repositories and the particular recommendations discussed in this article. The COAR recommendations document, for example, also provides guidelines for the management of translated content and advises to "include keywords in many languages" and to "use multilingual vocabularies and thesauri if possible" (COAR Task Force on Supporting Multilingualism and non-English Content in Repositories 2023) to further enhance the discoverability and visibility of non-English content. Next to open repositories, aggregators and discovery platforms should also develop or fine-tune guidelines and mechanisms to better process and display language-related metadata. Similarly, preprint servers, publishers, and other digital infrastructures archiving or producing scholarly content should also strive to better manage and document multilingualism, including translations. Finally, institutions should also develop strategies and commitments to advance and promote multilingualism in research, including mechanisms to improve its recognition or integration in research assessment.

In the long run, only a wider adoption of practices and recommendations espousing a decolonial trajectory of multilingualism in research will offer possibilities to potentially *decenter* English and recalibrate the volume of non-English content in an otherwise Anglocentric research system and its equally Anglocentric digital architecture. And because undoing and unlearning are staple practices of decolonial thinking and praxis (see Torres 2017; Montgomery and Trahar 2023; Schmidt 2023), the development of standards and recommendations for the support and management of multilingualism in research should remain a moving target, which should notably strive to involve thus far marginalized or excluded groups in this process.

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