# Quality Assurance in the Open: An Evaluation of OER Repositories

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## ABSTRACT

The World OER Declaration 2012 recommends that States join efforts to facilitate finding, retrieving and sharing OER. The OER movement has thus far spurred the creation of numerous repository initiatives worldwide with the aim of aiding the development of Open Educational Practice. This paper is based on the analysis on a set of 80 repositories of OER. In order to evaluate the quality of repositories, a set of ten quality indicators was obtained from an analysis of key literature. These indicators represent good practices in repository design, as they enable repositories to promote openness, sharing, reuse of resources and collaboration amongst academic communities. The incidence of the indicators within the actual repositories of OER is discussed, with the aim of understanding the extent to which these good practices are commonplace across repositories when considered by type, region, and overall. Although there are numerous references in the OER literature to the importance of these features in repository design, the actual initiatives demonstrate quite heterogeneous approaches, and some indicators achieve very low incidence considering the crucial role they play in supporting the aims of the OER movement. The significance of the various indicators is considered in relation to questions of overlap, practicality and sustainability, in order to suggest directions for further investigation and ultimately the improvement of these important repositories.

**KEYWORDS**    *Repositories, OER, Open Educational Practices, Quality Assurance, Evaluation*

# INTRODUCTION

Anyone with a passing interest in open and technology-enhanced learning might suspect that these days, it is all about MOOCs (Massive Open Online Courses), which have been widely heralded as a sort of 'revolution' or 'game changer' in the higher education sector. After all, some of the world's top institutions are now busily making high quality learning materials available free of charge, to 'students' who only need to sign up online rather than actually 'enrol' in the conventional sense. While this can be understood as a valuable and hitherto unseen opening of education to the masses, potentially superseding the model of Open Educational Resources (OER) predicated on the openness of *resources*, we believe that the OER movement remains a globally significant project. For Siemens (2013),

> The future of MOOCs is unclear, considering the rapid development of MOOCs from obscurity in late 2011 to mainstream attention in 2012. The OER movement is quickly evolving, as are software, content and platform providers. Media attention proclaims disruption for education. Regardless of what the future holds for open online courses, a critical need exists for learners from around the world to be able to access quality learning content and learning experiences. As the MOOC hype subsides, it is important for the OER movement to continue to advocate for openness, access and learner-focus.

It is therefore quite problematic to frame MOOCs as an evolution of the OER movement. Whereas the nature and degree of openness afforded by MOOCs appears to be variable (often limited to open enrolment), openness is at the core of the OER movement which is founded on the principle of making openly licensed, free resources shareable and reusable (UNESCO, 2012). In order for such Open Educational Practices (OEP) to become adopted as *mainstream* practice, it is necessary to consider how technical infrastructure underpins such activity, and how it might further support and enhance it. With this in mind, we have set out to consider what key features we should expect to find in Repositories of Open Educational Resources (ROER), and whether current repositories are meeting the challenges in practice.

The ethos of the OER movement was distilled in the 2012 Paris OER Declaration, which in article I encourages States to:

> Facilitate finding, retrieving and sharing of OER. Encourage the development of user-friendly tools to locate and retrieve OER that are specific and relevant to particular needs. Adopt appropriate open standards to ensure interoperability and to facilitate the use of OER in diverse media. (UNESCO, 2012)

It is difficult to see how these aims can be achieved without appropriate, purpose-built repositories. Indeed, during the last decade, ROER have been developed by numerous academic and governmental institutions internationally with the aim of supporting resource collection and exchange, and fostering participation by educators. These ROER are a diverse group, having grown up somewhat organically in variable contexts and with an eye to local needs.

In the next section we discuss the theoretical framework we have devised in order to evaluate ROER. At the core of this framework, developed through the analysis of relevant literature, is a set of ten Indicators for Quality Assurance (IQA) which we have identified as significant in the design, development, and implementation of ROER. Using these IQA we have evaluated 80 repositories, illuminating those areas in which they are generally working well to support open practices, those in which improvement is needed, and considering which improvements may prove more practical to implement in contexts where resources are increasingly scarce. Finally, in our concluding remarks, we propose guidelines for the future development of such repositories.

# CONCEPTUALISING QUALITY IN ROER

As the concept of OER dates from a UNESCO conference in 2002, ROER are a relatively recent phenomenon, but one which has antecedents in both institutional (document) repositories (IR) and Learning Object Repositories (LOR). In each of these cases, repositories are used in order to make content available and findable to user communities. LOR are multi-functional platforms which are designed to facilitate access to reusable learning objects (RLO) in a variety of formats, so users can search for, find and make use of this content (Downes, 2001; McGreal, 2004). As such they share a similar set of purposes and concerns with ROER. The differences between LOR and ROER stem from the differences between RLO and OER.

While there are certainly overlaps between these categories, there are differences of emphasis. RLO have been conceived of as digital learning units, specifically created for the purpose of sharing, whereas OER are generally accepted to comprise almost any type of resource as long as the sharer believes it has educational value and openly licenses it (Robertson, 2010). However, the clearest distinction is in terms of the explicit focus the OER movement places on open licensing of resources in order to allow both reuse, not only in the sense of using again, but also including the creation of derivative works (Fulantelli et al., 2008). According to Wiley (2009),

> For the last decade thousands of researchers have developed processes and strategies for designing, storing, managing, and providing access to learning objects, including metadata standards, repository specifications, and interchange formats. However, few have paid attention to the legal status of learning objects themselves and the unintended consequences of fully copyrighted learning objects on teaching and learning (p.9).

While the OER movement has attempted to address this issue through the use of open licensing, many of the other concerns relating to RLO also resonate within OER literature. Examples include the lack of information on how the resources (or objects) are being used and reused (Ochoa & Duval, 2009), and whether resource discoverability problems can be solved through the implementation of standardised metadata (Nash, 2005; Tzikopoulos et al., 2009; Currier et al., 2004). The literature on LOR has also highlighted the issue of quality assurance of repositories, as this is seen as key to provision of quality content to end users (Neven & Duval, 2002; Holden, 2003).

The current research is based on the analysis of ROER, that is, *repositories specifically designed for housing OER.* OER are here understood as

> any educational resources (including curriculum maps, course materials, textbooks, streaming videos, multimedia applications, podcasts, and any other materials that have been designed for use in teaching and learning) that are *openly available for use by educators and students, without an accompanying need to pay Royalties or licence fees* (Kanwar & Uvalic-Trumbic, 2011, p.5, emphasis added).

We also draw upon McGreal's (2011) definition of ROER as

> digital databases that house learning content, applications and tools such as texts, papers, videos, audio recordings, multimedia applications and social networking tools. Through these repositories, [OER] are rendered accessible to learners and instructors on the World Wide Web (p.1).

The purpose of OER repositories is to support educators in searching for content in a structured way, sharing their own resources, reusing existing materials and creating new resources through adapting or translating, and in collaborating with other members of the user community by commenting upon, reviewing, promoting and developing resources. Drawing

from our review of the literature, we argue that the ethos underlying OER (and therefore the creation of ROER) can be said to comprise four key themes, which we choose to refer to as *Search, Share, Reuse,* and *Collaborate*.

These themes, representing the varied types of activity which should ideally be enabled within or by a repository, are of course mutually interdependent (so, a resource must be shared before it can be searched for, adapted or reviewed). Table 1, below, shows the nature of each theme and what it contributes to the project of openness**.**

To obtain a set of indicators for quality assurance, relevant literature was reviewed and analysed from both open access and paywalled journals, books and conference proceedings mainly published since the inception of the OER movement in 2002. We found, according to the literature review that repositories should include certain characteristics. These pertain both to the social and technical aspects of the repositories. The social characteristics are those related to tools which enable social interaction within a ROER, while technical characteristics relate with the design and functionality of the ROER interface (Tuomi, 2006). The purpose of our literature review was to identify specific features highlighted by authors as specifically useful in this regard.

These features or indicators of quality assurance (IQA) should optimise access and participation, supporting users in searching, retrieving and selecting content, as well as in making content available. We have listed and explained each IQA in table 2 on the next page.

| Theme | Description |
|---|---|
| **Search** | In order for existing open content to be found and made use of, it is clear that such materials must be straightforward to search for and retrieve. As the content is housed in repositories, support for search and retrieval (within the repository interface, via an OER aggregation service, or indeed via popular search engines such as Google) is therefore crucial. |
| **Share** | Share represents the activity of educators who take the step of turning a learning resource into an open resource. Repositories can and must play a key role by not only enabling resources to be shared, but facilitating and encouraging sharing. |
| **Reuse** | The reuse of resources requires something of a shift in academic practice, and as such it also entails addressing barriers and resistance. Reuse must first of all be clearly permitted as well as convenient. |
| **Collaborate** | A successful repository will not simply be a virtual warehouse for content but a meeting place for communities of practice, within which knowledge is not only stored but exchanged, evaluated, and co-created. Through this affordance of social interaction, repositories can enable resources to be reviewed, commented upon, and rated. |

**Table 1** OER Themes

| Indicator of Quality Assurance | Description | Themes | Characteristics | Supported in the literature |
|---|---|---|---|---|
| **Featured resources** | Ability of featuring resources that are potentially of high interest for teachers because of it design or content. | Search, Share, Collaborate | Social | Hylén, 2006; Pegler, 2012 |
| **User evaluation tools** | Tools for the resources to be evaluated by users aiming to rate a resource. | Collaborate | Social | Downes, 2007; Richter & Ehlers, 2010; Clements & Pawlowski, 2012 |
| **Peer review** | Peer review as policy to revise and analyse each resource to ensure its quality. | Collaborate | Social | Larsen & Vincent-Lancrin, 2005; Schuwer et al., 2010; Windle et al., 2010 |
| **Authorship** | Analyse if the repositories include the name of the author(s) of the resources. | Search, Reuse | Social | Petrides & Nguyen, 2008; Browne et al., 2010; Kanwar et al., 2011 |
| **Keywords** | Methodically describe the resources to facilitate the retrieval of the materials within certain specific subject areas | Search | Technical | Davis et al., 2010; Richter & McPherson, 2012 |
| **Metadata** | Introduce standardised formats of metadata (Dublin Core - IEEE LOM - OAI-PMH) for interoperability | Search, Share, Reuse | Technical | UNESCO, 2011; OECD, 2007; Barker & Ryan, 2003; Brent, 2012; Pegler 2012 |
| **Multilingual support** | Design the interface of the in a multilingual way to widen the scope of users by allowing them to perform search of content in different languages. | Search, Share, Reuse, Collaborate | Technical | Richter & McPherson, 2012; Pawlowski & Hoel, 2012; OECD, 2007 |
| **Social Media support** | Introduce social media tools to enable the users to share the resources within social media platforms. | Search, Share, Reuse, Collaborate | Social, Technical | Jacobi & Woert, 2012; Alevizou, 2012; Kanwar et al., 2011 |
| **Creative Commons Licences** | Specify the type of Creative Commons Licence per resource or give information about the specific type of licence for all the resources. | Search, reuse, collaborate | Technical | Bissell, 2009; Wiley & Gurrell, 2009; Jacobi & Woert, 2012; OECD, 2007; |
| **Source Code or Original Files** | Allow downloading the original files or source code of resources so they can be adapted. | Reuse, Collaborate | Technical | Wiley, 2007; Tuomi, 2006 |

**Table 2** Indicators for Quality Assurance

## METHOD OF ANALYSIS

The focus of this research is on the evaluation of ROER, which house learning and teaching resources in a variety of formats, such audio, video, narrated presentations, interactive content, 3D representations or any other type of materials designed for teaching and learning. As there was no existing ROER-specific list or directory to work from, it was necessary to review a wide range of OER initiatives in order to identify qualifying repositories. A longlist of 450 global OER initiatives and 600 institutional repositories was obtained by reviewing the literature about OER case studies and from the Global List of OER Initiatives (http://www.wsis-community.org/pg/directory/view/672996), while the repositories reviewed were drawn from the Directory of Open Access Repositories (http://www.opendoar.org/). 80 repositories of OER met our criteria and were selected as the sample for our evaluation.

OER can also be found in other places which are not ROER, but these were considered beyond the scope of this study. We have excluded consideration of repositories which contain only audio or video, as the content is homogeneous, and may or may not be 'open'; proprietary platforms such as iTunes U which have specific standards and quality control systems; and whole courses in the form of Open Course Ware (OCW) and Massive Open Online Courses (MOOCs) which are not repositories of OER in the sense of individual units of content (and often do not consist of open content). We also excluded consideration of academic repositories which typically contain bibliographic content such as dissertations, articles, or grey literature (although these may sometimes also contain teaching materials).

The 80 repositories were evaluated qualitatively against the IQA. Some of these IQA (such as featured resources or multilingual support) represent a feature of an entire repository, while others could only be evidenced by examining individual resources (such as authorship or licensing information). Therefore in each repository a range of 10-15 OER were randomly selected and these were scrutinised in relation to those IQA which pertain to individual resources.

Finally, the repositories were analysed quantitatively by reviewing them by typology and region, so they could be categorised as national repositories, institutional repositories (managed by a single institution), institutional consortium repositories (managed by a group of similar institutions), regional repositories (managed by a specific region or area within a country) and international repositories (managed by multinational initiatives). Also, repositories were categorised as belonging to seven supranational geographical regions to gain a comparative view of the adoption and implementation of ROER internationally.

## RESULTS AND DISCUSSION

Analysis of the repositories by region and typology shows that ROER initiatives are substantially located in Europe and North America, as seen in figure 1 below. Only in Europe were all five repository types represented (regional and international repositories did not exist elsewhere). At the other end of the scale, in the Africa, Asia, Middle East and Oceania regions, few ROER existed and there was only one type found per each of these regions. Considering the repositories by type only, 50% are managed by a single institution or organisation; 23.75% are national repositories, which have usually been created as a result of a state-sponsored initiative and contain materials for the teachers of a country; 20% have been created by a consortium of organisations and institutions across a country (with a further 2.5% very similar but regional in focus); and 3.75% of the repositories are international.
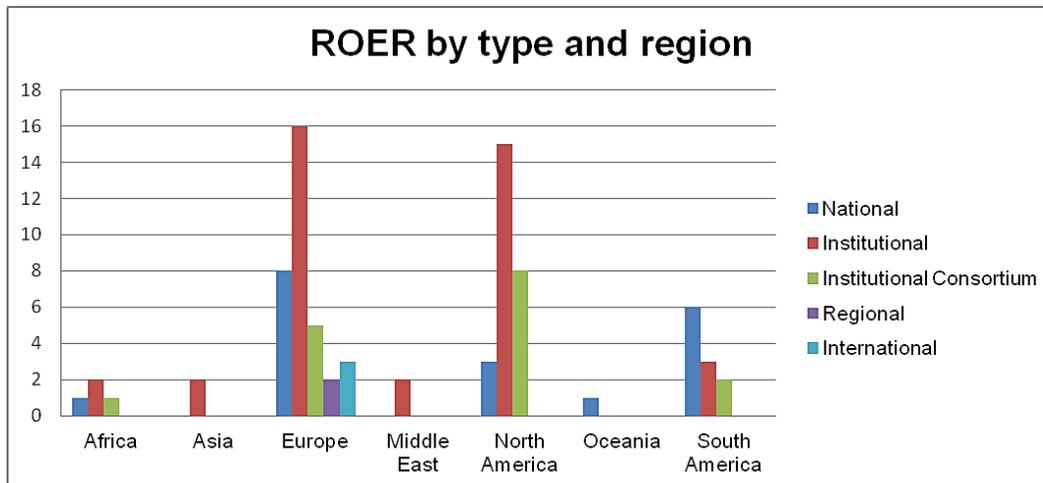
**Figure 1** ROER by type and region

In figure 2 below, we represent the incidence of each IQA in the ROER as a series of stacked columns, in order to also indicate the repository types. The most striking aspect of this view of the data is that overall incidence for most IQA is lower than we would have anticipated, considering the weight given to these features in the literature, although perhaps it is unsurprising that real world practices are lagging behind theory in this relatively new area of technical development. Of all the IQA, the ability to describe a resource using **keywords** is the one most supported by current ROER, being present in 75 of the 80. There are only three other IQA which exceed the half-way mark; these are **Creative Commons licensing**, indicating authorship of resources, and presence of **social media support**. As seen in the graphic, five further IQA (half of our total of ten indicators) are present in less than half, but more than a quarter of ROER evaluated. Finally, the IQA showing the lowest incidence with just eight is **peer review** of resources.
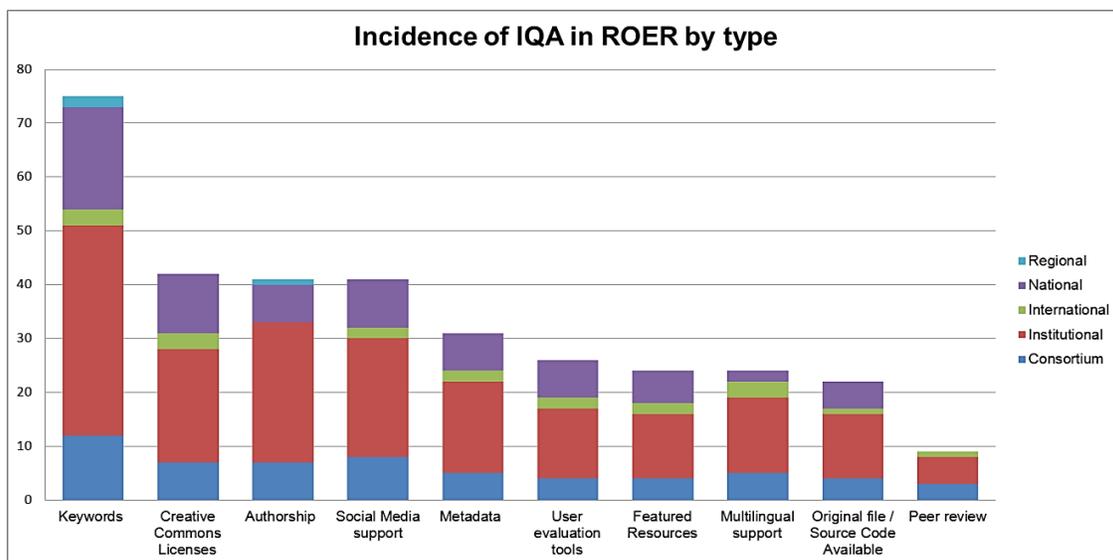


**Figure 2** Incidence of IQA in ROER by type

Of the ten IQA, four deal most explicitly with types of additional information which describes a resource. The most frequently occurring of these in the sample is **keywords,** with 93.75% of the repositories reviewed having integrated this method for resource description. Normally keywords are generated by the author / uploader of the resource, so they do not represent controlled vocabularies and therefore cannot be interoperated between repositories. Keywords can thus be seen as an imprecise and inconsistent method of describing resources; but nonetheless, they are a simple and cost effective method. **Metadata** on the other hand aims to provide highly accurate, consistent information to searchers; only 38.75% of the repositories include the use of *standardised metadata* such as either Dublin Core or Learning Object Metadata (Dublin Core - IEEE LOM - OAI-PMH) which has recommended for the design of repositories as it captures relevant information which can be transferred across repositories. Metadata is likely not viewed cost effective by the majority of repository operators, as its usage requires ongoing support from librarians.

The incidence of **Creative Commons licensing** in the sample was quite low, with 52.5% of reviewed ROER clearly stating the Creative Commons license (CCL) of the resources. Technically with no licence stated, users are required to assume that *all rights are reserved* (therefore, such a resource is actually a learning object rather than an OER). OER must be licensed individually with one of the 6 CCL licences which allow others to share and adapt the content. A similar percentage of the repositories (51.25%) state the **authorship** of the resources, without which it is more difficult for users to select, reuse or adapt resources. Unknown authorship is also out of step with normal academic practice, as authors expect to and should receive credit for their work, therefore the lack of acknowledged authorship may act as a barrier to sharing. The incidences of stated CC licence and authorship seem particularly low, considering that both are important and would likely be easy wins to implement.

Of the IQA which support resource discovery and collaboration amongst users, the most prevalent was **social media support,** found in 51.25% of the ROER we reviewed. These repositories enable the users to share links to resources via social media services (such as Twitter) and adds an interaction channel for the user communities. In contrast, less than a third of the repositories (32.5%) allow the users to rate the resources via **user evaluation tools**. Those which do support this have implemented systems for the users to review the resources, thus unlocking the communal knowledge of the users as subject experts who can provide valuable feedback on the materials made available. The most commonly used system to facilitate user review is *rating*, normally on a scale from 1 to 5 (often as a star rating which is quite common for other types of platforms).

Another method to promote resources in the repository is through the use of **featured resources.** 30% of the repositories employ this strategy a way to promote relevant and interesting content; however, it is often unclear how the featured resources were selected. The repositories generally do not state whether the featured content is highlighted because, for example, repository users or other subject experts had evaluated it, or because of its date of upload. Only a small number (11.5%) of the repositories reviewed have established formal **peer review** procedures for quality control. Although, according to the literature, this can be considered an efficient and reliable method to ensure resource quality, it is also resource intensive, and therefore not surprisingly has the lowest incidence of any IQA across the sample.

The other remaining IQA concern technical features which enhance levels of resource use and reuse. Although almost 75% of the ROER we reviewed contained materials in various languages, only 30% of the repository interfaces provide **multilingual support** enabling users to search for content in different languages. Finally, only 27.5% of the reviewed repositories enable the users to download the **original file or source code** of resources. As the literature highlights the importance of allowing users to

adapt or modify resources as a key quality of openness, this represents a significant barrier to resource remixing.

Overall, the *type* of repository (differentiated by colour in figure 2) does not appear to correlate strongly with IQA incidence, although it is notable that consortium repositories scored relatively highly across all indicators. National repositories, similarly, tended to provide strong

support for many of the IQA, although none of these supported peer review.

We also compared the incidence of the IQA by region. As there was wide variation in the sheer number of ROER between different regions, we have expressed this data in figure 3 (below) as a percentage of the ROER per region, in order to provide a clearer basis for comparison between regions.
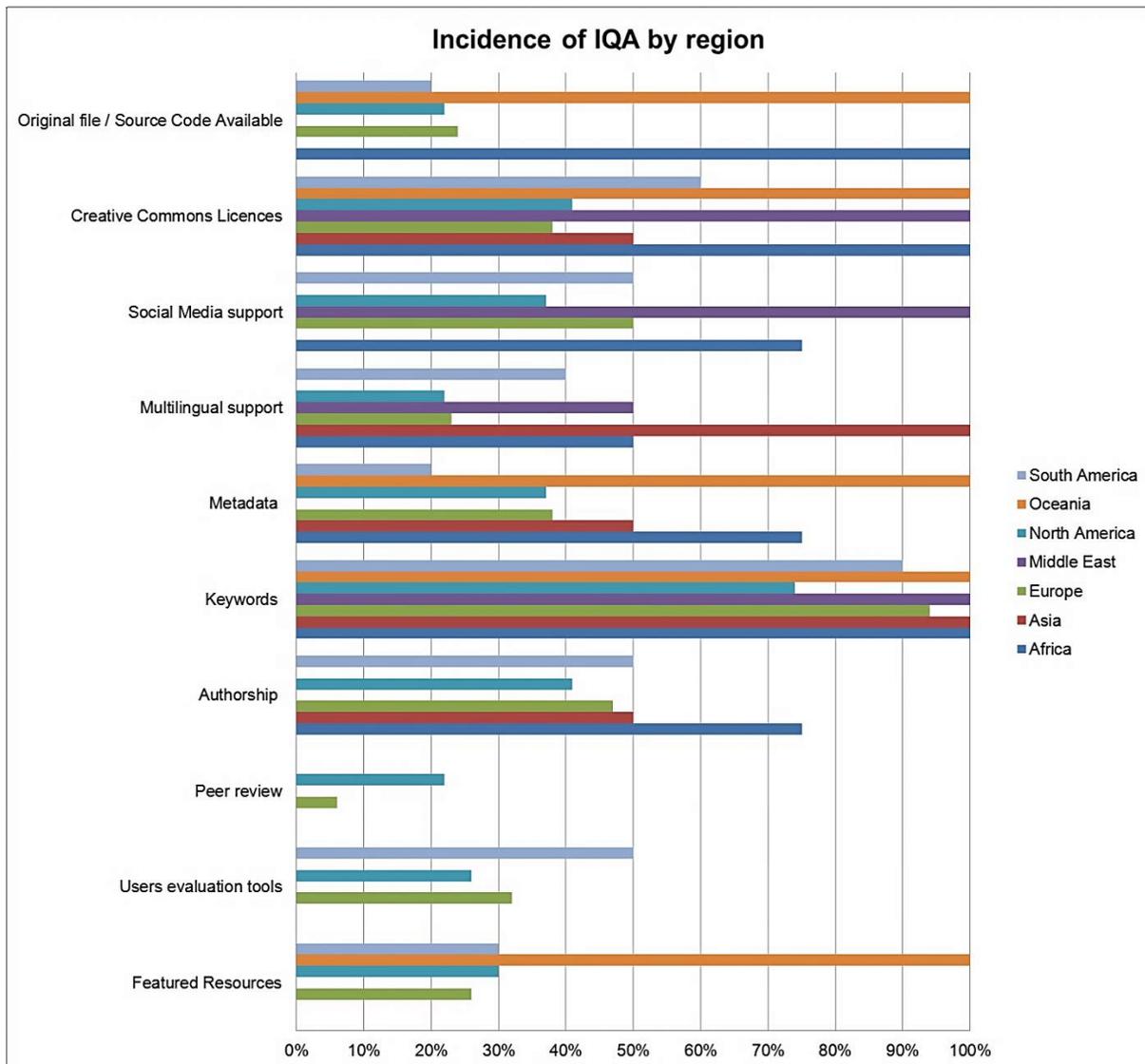


**Figure 3** Incidence of IQA by region

Considering the incidence of the IQA comparatively across regions, use of **keywords** was the most widespread, scoring highly in all regions, while ROER supporting **peer review** were found only in North America and Europe, and as a result these were the only regions in which all ten IQA were found.

One of the most notable features of this aspect of our analysis is that, in the regions where there are quite small numbers of ROER (i.e., Oceania, Africa, the Middle East and Asia), the incidence of various IQA is 100%. Of the ten IQA, seven are found in 100% of ROER in at least one region. The region achieving 100% incidence most widely across the IQA was Oceania with 5, based on a sample of just two repositories. Three IQA did not reach 100% incidence in any region; these are **peer review**, **user evaluation tools**, and (somewhat surprisingly) **authorship**.

While the very small numbers of ROER in some regions might indicate that levels of engagement with OER are lower in these regions than others, these results suggest an alternative explanation. Potentially, these small numbers of ROER may reflect deliberate strategies to centralise and focus resources into a smaller number of initiatives.

# CONCLUSION

It is clear that repositories have been widely adopted with a view to furthering the aims of the OER movement as comprehensively stated in the 2012 Paris Declaration. From our review of current ROER initiatives it is also clear that the last decade has seen a worldwide groundswell of support for open practices, including the creation of a wide array of repositories. It is not our intention to critique the diversity of these projects, which likely reflects local needs. Much more can be learned about good practices for ROER design and implementation by studying models which are already successful. However, as discussed in our results, the picture is complex, so this is not simply a case of identifying any single repository as one which

exhibits 'best practice'. Each of the IQA represents a good practice which has already been implemented – but as discussed above, in several cases these have not thus far been implemented widely. Further investigation of the design of ROER based in regions showing very high incidence of IQA, or of highly performing ROER types (i.e., consortium and national), may prove a fruitful starting point. Beyond this investigation, we suggest repository developers consider the feasibility of incorporating more of the IQA into current and future systems. We recognise that there is a degree of overlap between some IQA in terms of what aspects of open practice (theme) they support. On that basis it is unlikely that repository developers will (or necessarily should) seek to implement all ten. Instead, a balance must be struck between the ideal and the real, taking into account the resources available for development and sustainability.

In addition to their role in housing content, ROER have been created with the aim of generating consciousness of OER and stimulating academics to share knowledge within communities of practice. At a social level, the implementation of ROER should therefore adhere to the models of participatory information architecture. In other words, we believe repositories must not be planned as mere content containers, but as spaces which enable and promote retrieval, sharing and collaboration, and facilitate access for all potential users, as well as adaptation of existing materials for new purposes. Community expertise can be considered the primary method of quality control; if users are encouraged to evaluate and rate the resources they select, a sense of inclusive participation can be fostered. Also, the analysis of paradata which measures a resource's number of downloads or social media shares is an alternative, indirect route to understanding resource usage, which can then be used to feature resources. Furthermore, at a technical level, the developers of ROER must consider usability guidelines to enable easy access to the content, and ensure methods are in place to identify the intellectual property and licensing of resources.

ROER should also play a role in supporting and improving content quality. Educators do need to find relevant content, but they also require assurances around its origin and quality, and ideally, to gain a sense of the context in which a resource was initially designed and used. This, in turn, empowers decision-making around suitability of use 'as is', or the need to download the original resource for adaptation or translation purposes. While a strong case can therefore be made for the implementation of standardised metadata in ROER, we believe that this is unlikely to become the norm, due to the resource intensiveness of the metadata creation process. When planning repositories, we consider it is important to provide authors with a straightforward way to add a description of a resource, without forcing them to over-describe, which may discourage them from sharing at all.

In order to improve on current practices without placing additional resourcing burdens on operators of repositories, we propose that there should be more breadth and consistency in the data captured on upload. First of all, it is crucial that authors should identify themselves, as well as potentially state their institutional membership (which would facilitate search and analysis by author, region, or institution). Indeed, to help ensure the quality of the content it is important to provide a sort of 'gate keeping' mechanism such as requiring registration for those who want to share a resource, requesting them to provide at least a minimum of personal and institutional data (which then allows for automatic population of these fields on resource upload). For users simply wishing to access resources, no registration need be required.

Authors should additionally be responsible to indicate what licence applies to the use of the content they have provided, and give some basic information about the resource, possibly by adding an abstract that includes the pedagogical scope and a set of keywords. This data should be added on forms provided by the repository in a structured but simplified way. Ideally they should clarify if they followed any usability guidelines to create the resources and if students with learning disabilities will need extra support

or specific software to read, listen to, or view the resource. Also, authors should be asked to explain any technical requirements if specialist software is required to play or display the resource. Where possible (for example, where the resource contains machine readable text), repositories could also automatically perform content indexing on upload, which the author could then have the option to review and edit, or leave as is.

In this study we have demonstrated that addressing considerations of quality assurance in repository design forms part of a potential virtuous circle in OER. If repositories provide support for the realms of activity we have summarised as the four themes *Search, Share, Reuse* and *Collaborate*, they will therefore work actively to promote quality in the resources themselves. It is not therefore our intention to prescribe that all repositories should necessarily implement support for all of the IQA in a standardised fashion. Rather, we have attempted to show that in many cases, ROER have not yet become the tools for open practice that the key theoretical literature of the OER movement aspires to see.

## ACKNOWLEDGMENTS

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