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Innovation with Open Educational Resources: An integrative review of drivers, barriers and enablers

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Abstract

Open Educational Resources (OER) are frequently interpreted as supporting educational innovations across a range of delivery styles. However, the mechanisms for OER innovation are underexplored in the scientific literature. This paper offers an integrative literature review (N = 210) exploring innovation with OER in publications from 2015-2023, focusing on described drivers, barriers and enablers. Cases from all countries and implementation levels are considered, with an emphasis on qualitative factors. Results are synthesised into six categories (Structural, Systematic & Contextual Factors; Pedagogical Practice; Information, Awareness & Attitude; Resourcing & Sustainability; Technology & Infrastructure; Policy & Culture) with drivers, barriers and enablers mapped for each. We find that many studies refer to 'innovation' in ambiguous ways, and there is a need for more consistent ways of describing innovation practices that use OER. Many OER implementations experience barriers to innovation when an OER proposition requires institutional change or pedagogical adaptation. In addition, outside of English-speaking countries, translation and localisation remain highly significant barriers to innovation. There are many relevant barriers and enablers which are related to information and awareness, suggesting that these could be key to unlocking innovative practice. Many enablers of OER innovation emphasise greater openness in terms of pedagogical practice, open technologies and community engagement. Since many enabling factors involve interplay between stakeholders, a need for holistic case studies describing OER innovation in relation to wider networks is implied.

Keywords

OER; innovation; drivers; barriers; enablers; policy

1 Introduction

Open Educational Resources (OER) are teaching, learning and research materials in any medium – digital or otherwise – that are in the public domain and/or released under an open licence that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions. They are free at the point of use and 'free' in the sense that they provide users with greater freedoms in how resources are shared, used, customised and iterated. OER disrupt traditional copyright practices, presenting fresh avenues for facilitating teaching and learning. OER are often perceived as a driving force for innovation, nurturing an institutional culture that embraces pedagogical creativity and collaboration. The flexibility and collaborative nature of OER allow them to be used as a foundation for further innovation, whether through creation, co-creation, or novel pedagogical strategies (Coughlan et al., 2019; Otto, 2019; Senn et al., 2022; Smirani & Boulahia, 2022). OER can play a key role in distance and digital education, providing accessible and adaptable content to support remote learners. By leveraging OER in distance and digital education, institutions can enhance the flexibility and inclusivity of their instructional materials, ultimately promoting greater equity and access to quality education for students worldwide (Bossu & Ellis, 2023).

There have been a range of literature reviews conducted over the past two decades to understand the implementation of OER but these tend to focus on impact (e.g. Hilton, 2016; Weller et al., 2015; Tlili et al., 2019); reporting on the state of play of OER (Smith & Casserly, 2006; Wiley & Gurrell, 2009; Wiley, Bliss & McEwen, 2014) or on specific implementation contexts, for example in Africa (Tlili, et al., 2022), Indonesia (Fitriansyah et al., 2020), Australia (Bossu, Bull & Brown, 2012), Canada (McGreal, 2020) and Nigeria (Thanuskodi, 2020). In these and many other studies, OER are often labelled as 'innovative' or as drivers of innovation. However, forms of OER innovation are not consistently described, resulting in the term being used vaguely or inconsistently. OER have certainly been considered as an innovation (Lane, 2010). On a pedagogical level, merely incorporating OER into traditional methods of instruction does not necessarily transform the learning experience or introduce new ways of teaching. Innovation in education involves the creative use of resources and technology to enhance learning outcomes, promote critical thinking, and engage students in new and effective ways. Simply using OER as supplementary materials within traditional teaching practices may not represent a truly innovative approach to education (Andrade et al., 2011)).

In fact, the scientific literature still lacks a comprehensive conceptualisation of the relationship between OER and innovation (Guevara-Pezoa, 2023). The perception of OER as innovative is relative to one's prior experience and understanding of these resources. For early adopters, simply integrating OER into their teaching practices may seem innovative, whereas experienced users might view this as merely an initial step toward more advanced innovations, such as creating remixes of resources or transitioning to open pedagogy (Hegarty, 2015; Tietjen & Asino, 2021). To better understand how innovation has been understood, implemented, and practiced in the broader OER literature, we conducted an integrated literature review, which resulted in 210 papers being thematically analysed against three main themes: 'drivers', 'barriers', and 'enablers'. In this paper, we present the methodology adopted and discuss the results of our synthesis. Our research question is: How do relevant stakeholders understand the drivers, barriers and enablers relating to innovation with OER?

2 State of the art and conceptual framework

Understanding how factors like location, scale, or the maturity of OER implementation influence innovative behaviours is still limited. Additionally, exploring how various stakeholders conceptualise and communicate the value of OER to their target audiences is of enduring interest. Siloed OER reuse can make it harder for others to take advantage of the effective practice of others, limiting the spread of innovation. Routes to understand OER innovation for different stakeholders are needed and can be provided through an improved understanding of the drivers and enablers of innovation as well as the challenges faced.

To define stakeholders holistically, the study was guided by the European Network for Catalysing Open Resources in Education (ENCORE+[1]) which conceptualises macro, meso and micro actors within a single OER ecosystem. A key challenge is presented with regard to the plurality of examples of OER use, which transcends many countries, education levels, styles of implementation and diverse contexts of application. A related issue concerns the diverse, non-systematic and often ambiguous ways in which particular drivers, barriers and enablers are discussed across the literature. Schuwer & Janssen (2018) note that barriers and enablers are often different formulations of the same observation or idea. We agree with this insight and do not wish to overstress semantic differences. We make the distinction that drivers reflect originary or external motivations while enablers are a direct response to a perceived barrier. An emergent tripartite conceptual model allowed universal identification of the types of factors that were reported to influence OER innovation. These factors were classified as 'drivers', 'barriers', and 'enablers'.

- **Drivers**: 'Drivers' describe those factors which generate interest in innovative practice with OER. Drivers can be economic, political, cultural, ideological, institutional or personal.

- **Barriers**: 'Barriers' impede or prevent innovative practice with OER. In the initial review of literature the terms "barriers" and "challenges" were treated separately. This proved not to be meaningful since these terms are often used interchangeably. In the reporting below they are combined into one category. Barriers are obstacles or challenges that impede the successful implementation and adoption of OER in educational contexts. In this study we focus on those factors which are reported to affect innovation behaviours.

- **Enablers**: 'Enablers' are factors or strategies that facilitate the successful integration and adoption of OER innovations in educational settings. Enablers reflect a degree of maturity in an OER implementation and are themselves often the reported results of innovation or experimentation. Many of the enablers identified originate from a change in institutional or business practice, the basis of which was the attempt to overcome or solve a problem limiting the use of OER.

[1] European Network for Catalysing Open Resources in Education, https://encoreproject.eu/

3 Method

This study used an adapted PRISMA review process (Moher et al., 2010; Rethlefsen & Page, 2022; Page et al., 2021) to identify relevant literature (Figure 1). To support the rigour of this qualitative study, we adapted Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA, 2020) for an integrative review by defining the objectives and a protocol to outline the search strategy, inclusion/exclusion criteria, and data extraction methods to ensure thoroughness and replicability (Sutton et al., 2019). The results were then read collaboratively and qualitatively by the researchers before compiling results and impressions of the body of literature. A second stage of the analysis involved retrieving from the text of these studies information about identified drivers, barriers and enablers of OER innovation that were supported by some empirical data. The results were reviewed in more detail with a focus on OER innovation and concisely describing the related drivers, barriers, challenges and enablers. A qualitative, integrative process (Snyder, 2019; Torraco, 2005) was used to try and critically understand the emergent relationships between factors influencing innovative practice. The overall goal of the research was not to offer a comparative assessment of the evidence provided in support of the different innovation factors or to offer a synthesized theory of OER innovation. The priority was to develop an integrated, qualitative overview of the literature, which could form the basis of a new conceptual framework or be used to identify possibilities for future research.

3.1 Search strategy

The SCOPUS database was used for the search. SCOPUS indexes almost 28,000 scientific journals; more than 330,000 books; and 12 million conference papers. It was selected because of its comprehensive nature and for offering structured query language in requests to the database. The initial search was for any combination of the terms "OER" and "innovation" and provided 238 results. The second search was for "OER" and "drivers" or "barriers" or "challenges" or "solutions" or "enablers". In the interests of reliability and validity, conference proceedings, book chapters and journal articles were included but grey literature, doctoral and masters theses were excluded. This yielded 399 results. The total resources considered was therefore 637. 188 duplicates and false positives (e.g. from Chemistry results where OER is an acronym for "oxygen evolution reaction") were removed.

3.2 Screening

Items published in 2015 and before were then excluded to focus on publications which reflect the current maturity of OER implementation. Some literature reviews were included where they provided secondary reporting on empirical data. Figure 1 illustrates the literature selection process.

3.3 Data extraction

A shared spreadsheet and document were used to organise the analysis. Data extraction focused on identifying relevant qualitative data and extracting this into a shared document organised into drivers, barriers, and enablers. This information was abstracted and recombined experimentally in various ways using different themes to cluster and make sense of the data before arriving on the presentation here. The process of combining, reviewing and reorganising the data was completed in August 2023. The recombined data was verified through peer review and some minor changes made to categorisation. Once categorised, the research team wrote brief commentaries to interpret and make sense of the clustering that was produced. These in turn were peer-reviewed and iteratively redrafted to arrive at the presented synthesis.

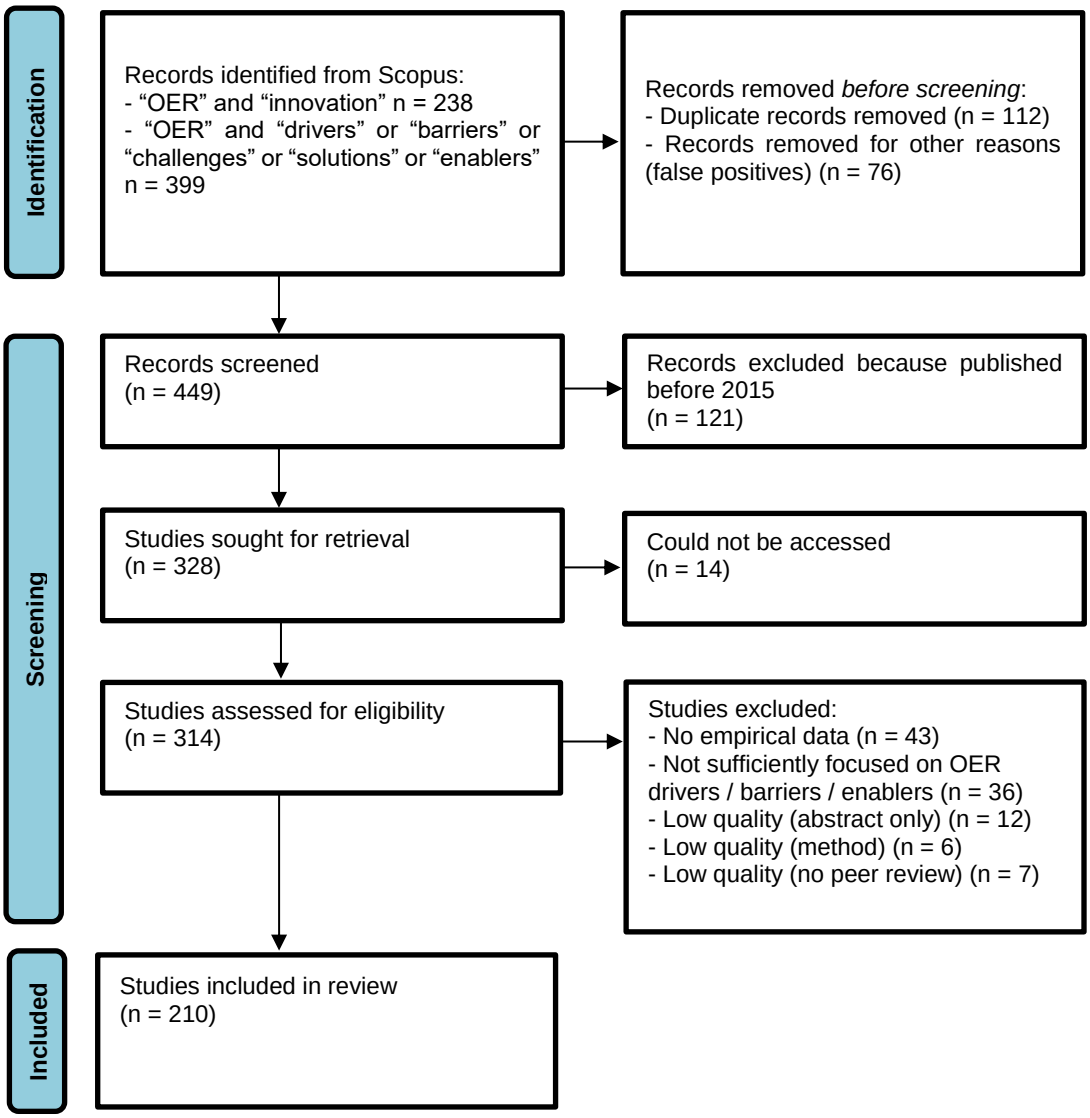

Figure 1. Adapted PRISMA literature review selection process

3.4 Quality assessment

During the review process some items were filtered out for lacking relevant empirical data (n = 43); not being sufficiently focused on OER and relevant drivers, barriers and/or enablers (n = 36); or for being of low quality (n = 25). Studies were excluded on the basis of low quality because they were actually an extended abstract (e.g. from conference proceedings) (n = 12); because the methodology was unclear or absent (n = 6); or because there was no apparent mechanism of peer review (n = 7).

4 Results

The journal titles appearing most frequently in the dataset are the *International Review of Research in Open and Distributed Learning* (30) and the *Journal of Interactive Media in Education* (9), publications with an emphasis on open education. A diverse range of other journals are represented, including examples of OER practices being adopted within different subject areas. Perhaps surprisingly, there are few publications which take as their main theme OER and innovation (especially in Europe). Results are presented according to the dominant themes identified (see Table 1 in Section 5). A synthesis of the extracted data is presented for each theme for drivers, barriers and enablers sequentially. The thematic clusters are Structural, Systematic & Contextual Factors (4.1); Pedagogical Practice (4.2); Information, Awareness & Attitude (4.3); Resourcing & Sustainability (4.4); Technology & Infrastructure (4.5); Policy & Culture (4.6).

4.1 Structural, systematic & contextual factors

4.1.1 Drivers

Access and equity strategy: One of the most frequently cited drivers for OER innovation is the enhancement of access to education (Ben Brahim et al., 2017; Bohrer et al., 2016; Bossu et al., 2016; Brahim et al., 2020; Blackmon, 2018; Blomgren, 2018; Hameed & El-Ameer, 2020; Henderson & Ostashewski, 2018; Herrera-Cubides et al., 2022; Kopp et al., 2017; Mays, 2020; Mazohl et al., 2018; Wong & Li, 2019). This broad objective encompasses various aspects, such as improving accessibility, expanding teacher education (Buckler et al., 2021), and supporting lifelong learning initiatives (Navarrete & Lujan-Mora, 2016). Additionally, responding to the growing numbers of tertiary students worldwide (Dix, 2016) and meeting the increased demand for non-formal learning (Zhu & Kadirova, 2020) are important considerations. Social justice is also a driving factor, with studies highlighting the role of OER in promoting equitable access (Bencheva & Kostadinov, 2019; Cox & Trotter, 2016; Henderson & Ostashewski, 2018; Jenkins et al., 2020).

Cost reduction: As traditional educational materials become increasingly expensive (Craig, 2020; Delgado et al., 2019), OER can help reduce student costs (Farrow et al., 2020; Fischer et al., 2017; Henderson & Ostashewski, 2018; Hilton, 2020; Hollister & Patton, 2021; Julien et al., 2018).

Contribution to knowledge: OER contribute to the knowledge society (Masterman, 2016; Pande et al., 2019), increase access to knowledge (Mengual-Andrés & Rico, 2018), and support personal and cultural practices (Rolfe, 2017).

Crisis and disruption: Responding to crises and disruptions has become a notable driver for OER innovation. The Covid-19 pandemic led to significant disruption and increased the demand for online education (Gill et al., 2020; Markin, 2021; McGreal et al., 2022; Rocha et al., 2021; Sánchez González et al., 2022). Additionally, the cost of living crisis has underscored the need for affordable educational solutions (McGreal et al., 2022), while support for teachers during the pandemic has highlighted the importance of adaptable and accessible resources (Mays et al., 2021).

4.1.2 Barriers

Aligning strategy for OER adoption: Effective collaboration across borders can be challenging (Saay & Margaria, 2020), and continual improvement in OER practices is often hindered by insufficient mechanisms for knowledge sharing (Bohrer et al., 2016) and ongoing quality assurance (Almazyad, 2019). Additionally, integrating OER strategies with considerations of cost, quality, and access can be problematic (Abeywardena, 2017; Pande et al., 2019), and there is often

a lack of adequate training for educators on OER usage and virtual mobility (Jacqmot et al., 2020; Otto, 2019).

Shaping institutional practice: Within institutions, the development of effective OER publishing workflows can be challenging (Perez, 2017; Santiago & Ray, 2020), and there may be difficulties in establishing generic OER policies (Tisoglu et al., 2020). Harmonising OER initiatives across different departments or institutions can also be problematic (Santos-Hermosa et al., 2020). Resistance to change in higher education often arises (Bonami et al., 2020), and there is a need to shift from mere operational compliance to more strategic engagement with OER (Cox & Trotter, 2016).

Navigating cultural and global realities: Acknowledging and integrating cultural nuances into OER development is crucial but often overlooked (Abeywardena et al., 2018; Bencheva & Kostadinov, 2019). Addressing differences in OER terminology and approaches can create barriers to effective communication and implementation (Baran & Al Zoubi, 2020; Bohrer et al., 2016). Additionally, managing the varying levels of OER development across countries can be challenging (Alkhasawneh, 2020; Ayoub et al., 2020; Kosmas et al., 2021).

Assessing impact: Ensuring comprehensive coverage of OER is a significant challenge (Dumbrăveanu, 2021), and finding suitable resources for specific groups can be difficult (Mays, 2020). The impact of OER on diverse groups needs further exploration (Jenkins et al., 2020), and incorporating contextual factors into OER research is often inadequately addressed (Kılıçkaya & Kic-Drgas, 2021). Integrating OER into curricula (Lin, 2019), localising materials (Ponte et al., 2021), and effectively monitoring the learning process (Tlili et al., 2021) are additional hurdles. Providing necessary ancillary materials is also a challenge (Ponte et al., 2021).

4.1.3 Enablers

Community engagement and advocacy: Community engagement and advocacy are crucial for promoting OER innovation. Campus-based advocacy for OER can significantly influence adoption (Hassan et al., 2019). Discipline-specific workshops enhance awareness and practical knowledge about OER (Santiago & Ray, 2020). The growing availability of OER further supports this engagement (Navarrete, Lujan-Mora & Peñafiel, 2016). Involving a broad range of stakeholders, including non-profit and higher education collaborations, can create synergies and improve coordination (Morales & Baker, 2018; Ng et al., 2019; Reid & Maybee, 2021; Ren, 2019; Tlili et al., 2020). OER is also seen as a boundary object, facilitating diverse interactions and collaborations (Ritella et al., 2017). Volunteer communities play a role in this ecosystem by contributing to and supporting OER initiatives (DeVries, 2015).

Mature OER strategy: Strategic factors are pivotal in advancing OER innovation. The digital transformation of education and readiness for change are significant enablers (Bonami et al., 2020). The increasing interest in micro-credentials also impacts OER strategy (McGreal et al., 2022). Institutions experimenting with digitalisation and innovation can foster OER integration (Orr et al., 2019). A clear institutional vision and strategic approach to OER are crucial (Almazyad, 2019; Axe et al., 2020; Datt & Singh, 2022). The use of checklists for mainstreaming OER can support systematic implementation (Abeywardena, 2017).

Support and resources: Support and resources are fundamental to the success of OER initiatives. Academic library services often play a central role in providing support for OER (Cooke et al., 2022; de Jong et al., 2019; Ferguson, 2017; Kohout-Tailor & Sheaffer, 2020; Petrides et al., 2016; Perez, 2017; Vogus, 2019; Zaid & Alabi, 2021). The centralization of instructional design

contributions can also enhance support (Ren, 2019). Institutional services, including support structures and OER Steering Committees, contribute to the effective implementation of OER (Axe et al., 2020; Datt & Singh, 2022; Sheu & Shih, 2017; Tillinghast, 2020; Towey et al., 2017; Wiley et al., 2016; Zhang & Li, 2017; Anderson et al., 2021). Readiness of campus personnel and internal grant-making stimulate OER development (Anderson et al., 2021; Otto, 2019; Schuwer & Janssen, 2018; Thomas & Bernhardt, 2018). Streamlining quality review processes and providing tools for multi-language collaboration are additional support mechanisms (Navarrete & Martinez-Mosquera, 2020; Nurhas et al., 2016). It's important to provide educators with additional support during the implementation of OER (Anderson et al., 2021; Henderson & Ostashewski, 2018).

4.2 Pedagogical practice

4.2.1 Drivers

OER as collaboration catalyst: OER are thought to contribute to fostering collaboration among educators and learners. They can serve as a catalyst for collaborative practices, enabling more effective teamwork and shared educational experiences (Axe et al., 2020; Baas et al., 2023; Baran & AlZoubi, 2020; Bencheva & Kostadinov, 2019; Blomgren, 2018; Kruger & Hollister, 2021).

Institutional culture: OER can facilitate the development of an institutional culture that supports and encourages innovative teaching practices and collaborative approaches to learning (Coughlan et al., 2019; Otto, 2019; Senn et al., 2022; Smirani & Boulahia, 2022).

Pedagogical enhancement: OER facilitate digital education by providing accessible and adaptable resources (Bonami et al., 2020). They can improve learner confidence through engaging and supportive materials (Alario-Hoyos et al., 2017). OER can also contribute to better pedagogy through co-creation processes, which allow for the collaborative development of educational content (Mazzucato & Kic-Drgas, 2021). Additionally, they support problem-based learning by offering resources that address real-world problems and encourage critical thinking (Breathnach et al., 2021).

Improving learning outcomes: OER have the potential to enhance learning outcomes by improving student performance (Bodily et al., 2017; Nagashima & Hrach, 2021). They can also boost the success rates of Technical and Vocational Education and Training (TVET) learners (Mazohl et al., 2018). Overall, OER contribute to better student learning experiences and outcomes (Blackmon, 2018; Brandle, 2018; Kwak, 2017; Schuwer & Janssen, 2018). The inadequacy of proprietary textbooks, as noted by Finlayson (2020), further highlights the value of OER in providing accessible, relevant, and up-to-date educational materials.

4.2.2 Barriers

Curriculum integration: Difficulties often arise in finding suitable resources and integrating OER into existing curricula (Henderson & Ostashewski, 2018; Oelfke et al., 2021; Todorinova & Wilkinson, 2020). The lack of appropriate resources can hinder the adoption of OER (Brandle, 2018), which often remains supplementary rather than driving significant curriculum changes (Daukšienė et al., 2020; Jung & Hong, 2016; Lin, 2019). Selecting the right OER is challenging (Reid & Maybee, 2021), and concerns about the alignment of OER with pedagogical goals complicate its integration into educational practices (Burgos & Corbí, 2018; Oelfke et al., 2021; Truong et al., 2021; Wong & Li, 2019).

Educator engagement: Adjunct faculty, who often rely on mandated textbooks, may face challenges in adopting OER (Cooke et al., 2022). Additionally, digital access is not always preferred by all educators (McFaul & Fitzgerald, 2021), some of whom may be reluctant or slow to adapt to online learning (Jacqmot et al., 2020). The expectation that educators fulfil roles traditionally managed by publishers (Wang & Wang, 2017), coupled with a lack of innovative teaching strategies (Tlili et al., 2021) and the skills needed to develop OER (Kimball et al., 2022; Muganda et al., 2016), can further limit engagement. Anxiety among learners regarding the use of OER (Axe et al., 2020) and the unfamiliar practice of open sharing (Schuwer & Janssen, 2018) also contribute to these challenges.

Implementation: Implementation issues highlight a gap between the theoretical benefits of OER and their practical application (Schuwer & Janssen, 2018; Nkuyubwatsi, 2018; Villar-Onrubia, 2022), as well as inconsistent patterns of engagement (Sunar et al., 2020; Tlili et al., 2020; Zaatri et al., 2020) and high dropout rates in MOOCs (Kaabi et al., 2020).

Localisation: Localisation presents significant barriers, particularly with respect to language and regional differences (Jung & Hong, 2016). Language barriers, often due to the predominance of English-language OER and Global North perspectives, complicate the localisation of resources and can result in additional translation costs (Abeywardena et al., 2018; Baas et al., 2022; Cinganotto & Cuccurullo, 2016; Datt & Singh, 2022; Dreisiebner et al., 2021; Georgiadou & Kolaxizis, 2019; Kosmas et al., 2021; Kwak, 2017; Maharaj et al., 2021; Mishra et al., 2022; Navarrete & Martinez-Mosquera, 2020; Olivier, 2018; Pounds & Bostock, 2019; Zhu & Kadirova, 2020). Even when appropriate resources are found, their reuse may be limited by their pedagogical design, making it challenging to blend them effectively with existing materials (Burgos & Corbí, 2018; Oelfke et al., 2021; Truong et al., 2021; Wong & Li, 2019). These localisation challenges, along with issues of paternalism (King et al., 2018) and the difficulty of using OER outside of their original context (Jacqmot et al., 2020; Sunar et al., 2020), further hinder innovation in OER adoption and integration.

4.2.3 Enablers

Innovative pedagogical practice: Innovative pedagogical practices are key to driving OER innovation. Accessible and interactive OER enhance learning experiences, allowing for adaptive learning that can cater to individual needs (Liu & Johnson, 2020; Tlili et al., 2021). Designing OER with an emphasis on reuse and supporting the 'open' aspect of teaching and pedagogy further fosters innovation (Lin, 2019; Zhang et al., 2021). Moreover, approaches that focus on complex problem-solving, critical thinking, creativity, and collaboration—such as gamification and innovative assessments—may enhance learner engagement and contribute to the effectiveness of OER (Axe et al., 2020; Chan et al., 2021). Involving learners as co-creators of OER and utilising non-disposable assignments promote active learning and deepen engagement with the material (Andone et al., 2020; Seraphin et al., 2019; Werth & Williams, 2021b). Open pedagogy, which emphasises participation and collaboration, alongside participatory pedagogy, personalises the learning experience and empowers students to take ownership of their learning (Axe et al., 2020; Hajri et al., 2017; Kaabi et al., 2020; Seraphin et al., 2019; Tillinghast et al., 2020; Vera et al., 2022; Werth & Williams, 2021a; Werth & Williams, 2021b). Reflective curation and the involvement of interdisciplinary teams in student co-creation further enhance the relevance and applicability of OER in diverse educational contexts (Breathnach et al., 2021; Deshmukh & Sahasrabudhe, 2020).

Perspective change: OER innovation can be enabled by a change of mindset. For instance, adopting a 'produsage' paradigm, where OER is actively created, shared, and repurposed, encourages educators to move beyond mere usage to re-appropriation of existing OER (MacKinnon & Pasfield-Neofitou, 2016; Pulker & Kukulska-Hulme, 2020). Constructivist

pedagogy, which emphasises the active role of learners in constructing knowledge, can also be a powerful enabler (Karunanayaka et al., 2016; Senn et al., 2022). Engagement with OER can lead to changes in educator practice, with the integration of OER into teaching practices helping to bridge the gap between theory and practice (Hood & Littlejohn, 2017; Rivera & Chotto, 2017; Arnett, 2018). Professional development and reflective practice can sustain this shift, ensuring that educators are continuously adapting and improving their approaches (Finlayson, 2020; Risquez et al., 2020; Senn et al., 2022; Tillinghast, 2020).

Pedagogical support: A blended approach to repository use and the design of effective online learning environments provide the necessary scaffolding for educators to implement OER effectively (Andone & Vaisu, 2016; Risquez et al., 2020). Flexibility in delivery methods and personalised learning pathways cater to the diverse needs of learners, making OER more accessible and effective (Andone et al., 2020; Jacqmot et al., 2020; Ng et al., 2019). Additionally, offering OER/MOOCs in non-English languages and recommending appropriate resources to learners can broaden the reach and impact of OER (Brahim et al., 2020; King et al., 2018). Regular reviews of course content and delivery, alongside the social interactions fostered by OER, contribute to a dynamic and responsive educational environment (Cozart et al., 2021; Sandanayake, 2019). Institutional support and incentives for educators are vital for fostering OER innovation. Training programs that address the skills gap, unfamiliarity with open sharing, and lack of innovative teaching strategies are essential (Finlayson, 2020; Risquez et al., 2020; Senn et al., 2022; Tillinghast, 2020). Encouraging broader educator engagement, particularly among part-time faculty who may have limited opportunities to participate in OER initiatives, also contributes to an inclusive environment that supports OER innovation (Cooke et al., 2022).

4.3 Information, awareness and attitude

4.3.1 Drivers

Attitudinal change: One of the significant drivers of OER innovation is the shift in attitudes and mindsets regarding openness and the use of OER. This change is crucial as it lays the foundation for broader acceptance and implementation of OER and Open Educational Practices (OEP) which are teaching, learning, and research practices that leverage the potential of OER and openness to improve educational access, equity, and quality. The literature highlights various instances where a positive shift in mindset has led to increased engagement with OER. For instance, Abeywardena (2017), Baas et al. (2019), Baran & Al Zoubi (2020), Chotto & Rivera (2017), Christoforidou & Georgiadou (2021), Kopp et al. (2017), Kumar & Singh (2019), and Kwak (2017) all emphasise the importance of attitudinal change in fostering an environment conducive to OER innovation.

Awareness of OER/OEP: Awareness of OER and OEP is another key driver that significantly influences the adoption and integration of these resources. The literature indicates a growing awareness of OER, which has been instrumental in promoting their use across various educational contexts. For example, learning from the shared experiences of others, as discussed by Ponte et al. (2021), has been crucial in spreading awareness. Additionally, there is an increasing recognition of open pedagogy, which further supports the adoption of OER (Shemy & Al-Habsi, 2021). Dell (2021) and Wiche & Ogunbodede (2021) also note the growing awareness of OER, which contributes to their increased utilisation.

4.3.2 Barriers

Access: One of the major barriers to OER innovation is access, particularly in addressing student concerns and ensuring that OER are inclusive and accessible to all users. A significant challenge is the disregard of users with disabilities, as noted in Brahim et al. (2020) and Ben Brahim et al.

(2018). Furthermore, the literature points out a lack of studies on accessibility, which further complicates efforts to make OER more inclusive (Moreno et al., 2018).

Encultured practice: Another prominent barrier is the entrenched practices within educational institutions that resist change. Changing the narrative around professional development to include OER is difficult, as educators often face challenges in establishing the suitability of OER for specific uses (Jung et al., 2016). Additionally, sourcing high-quality images with correct attribution is a known issue (Perez, 2017). Educator resistance to adopting OER is another significant barrier, with Henderson & Ostashewski (2018) and Hollister & Patton (2021) highlighting the reluctance of some educators to embrace these resources. The low prestige of OER in regions where the concept is relatively new further hinders its adoption (Dumbrăveanu, 2021). In some educational cultures, traditional practices make it difficult to introduce OER (Shemy & Al-Habsi, 2021). Additionally, personal barriers, such as lack of understanding and motivation, can impede OER uptake (Tang & Bao, 2021).

Low awareness: The literature consistently identifies low awareness as a significant barrier to OER innovation. A widespread lack of understanding about open licences (Hassan et al., 2019; Luo et al., 2020; Tisoglu et al., 2020; Wright et al., 2016) and OER policies (Marín et al., 2022) are key issues. Additionally, a lack of a comprehensive catalogue of OER (Todorinova & Wilkinson, 2020) and the general low awareness of OER among educators and learners alike (Buckler et al., 2021; Datt & Singh, 2022; Farrow et al., 2020; Islim & Cagiltay, 2016; Mays, 2020; Muganda et al., 2016; Otto, 2019; Pérez-Paredes et al., 2018; Pounds & Bostock, 2019; Senn et al., 2022; Zaid & Alabi, 2021) further exacerbate the problem. In specific regions, awareness of OER remains particularly low (Georgiadou & Kolaxizis, 2019; Hassan et al., 2019; Karipi et al., 2022; Kinyua, 2021).

Knowledge & impact: Barriers related to knowledge and the impact of OER also pose significant challenges. The concept of "dark" reuse of OER—where resources are used without proper attribution or in ways that obscure their origins—highlights the need for greater transparency and understanding of how OER are used (Arnett, 2018). Demonstrating the efficacy of OER is another challenge, as there is a lack of comprehensive studies reflecting the impact of OER in specific regions or countries (Hilton, 2020; Julien et al., 2018). Most research tends to focus on adoption rather than innovation, which limits the understanding of OER's full potential (Luo et al., 2020). Furthermore, more research is needed to reflect on student perceptions and experiences with OER (Lin, 2019) and to better understand the impact of OER interventions (Jenkins et al., 2020).

Quality & trust: Perceptions of quality and trust also serve as significant barriers to OER innovation. Differing perceptions of OER quality (Lin, 2019) and the low acceptance or trust of these resources (Pande, 2019) hinder broader adoption. The perception that OER are of lower quality compared to proprietary resources is a recurring issue in the literature (Julien et al., 2018). Additionally, concerns about the quality of domain-specific OER (Pounds & Bostock, 2019) and the need to improve recognition of open textbooks (Brandle, 2022; Kruger & Hollister, 2021) are critical barriers that must be addressed.

4.3.3 Enablers

Stakeholder engagement: One of the key enablers of OER innovation is the active engagement of stakeholders. Cultural readiness, as discussed by Anderson et al. (2021) and Truong et al. (2021), plays a crucial role in facilitating the adoption of OER. Engaging stakeholders through a "diversity of experience" (Jiménez-Castañeda et al., 2019) and raising the profile or visibility of OER (Islim & Cagiltay, 2016; Judith & Bull, 2016) are important steps. Instructor willingness to

embrace OER (Karipi et al., 2022) and promoting OER-based learning among undergraduates (Sandanayake, 2019) further contribute to its uptake. Outreach activities, such as conferences and workshops, are essential in raising awareness about OER (Farrow et al., 2020; Zaid & Alabi, 2021). Additionally, using OER in teaching can lead to important discussions about copyright, enhancing understanding among educators (Kohout-Tailor & Sheaffer, 2020; Lin, 2019).

Educator mindset: Shifting the mindset of educators towards the benefits of OER is another critical enabler. Enculturing the publication of educational materials as OER is an essential step in this direction (Alkhasawneh, 2020). Emotional regulation (Zhang, 2020) and empathic approaches to OER implementation (Axe et al., 2020) are strategies that help educators adapt to the open-sharing paradigm. Making the innovative features of open sharing and reuse clear to educators (Schuwer & Janssen, 2018) and popularising tools that drive OER uptake (Schön et al., 2017) are also vital. Additionally, providing support for copyright issues (Nagashima & Hrach, 2021; Otto, 2019; Schuwer & Janssen, 2018) can help educators feel more confident in adopting OER.

Knowledge base: Strengthening the knowledge base around OER is another enabler of innovation. The growing body of research on the impact of OER (Jenkins et al., 2020) provides valuable insights that can encourage further adoption. Tools that emphasise transparency (Schön et al., 2017; Sunar et al., 2020; Tammaro et al., 2017; Vollman, 2021) and share data about educational systems (Saay & Margaria, 2020) are crucial for building trust in OER. Additionally, sharing localised examples of good practice (Jemni & Khribi, 2016) and using dedicated tools to track and build a picture of OER research (Kaur et al., 2022) contribute to a more robust knowledge base.

Quality feedback mechanisms: Effective feedback mechanisms are essential for ensuring the quality and relevance of OER. Community-driven OER taxonomies (Chan et al., 2021) and contextual specificity in OER implementation (Oelfke et al., 2021; Villar-Onrubia, 2022; Wijayati et al., 2022; Wolfenden & Adinolfi, 2019; Zhu & Kadirova, 2020) are important strategies. Quality reviews for OER (Fischer et al., 2017) and aligning reusability with learning analytics (Bodily et al., 2017) help ensure that OER meet educational standards. Additionally, scoring OER quality in repositories (Gordillo et al., 2020) and incorporating student feedback (Cooney, 2017) are critical for maintaining high standards.

Empowered vision: An empowered vision among educators and institutions is a key enabler of OER innovation. Acceptance from staff and administration that refinement is a continuous process is important for fostering a culture of innovation (Kimball et al., 2022). The desire to experiment with pedagogy (Masterman, 2016) and an emphasis on autonomy and user needs (Petrich, 2020) are driving factors. Increasing "open thinking" among learners as a result of OEP/OER (Jung & Lee, 2022), aligning with institutional missions (Masterman, 2016), and developing sector-specific OER competence frameworks (Voß et al., 2018) are also crucial. A shared vision or philosophy (Petrucco & Ferranti, 2020) and student empowerment (Mazzucato & Kic-Drgas, 2021) can enhance the potential for OER innovation.

4.4 Resourcing and sustainability

4.4.1 Drivers

Funding streams: One of the key drivers of OER innovation is the availability of funding, which can significantly influence the creation and adoption of OER. National funding for OER initiatives has been a critical enabler, as seen in countries like Australia, where a national roadmap for OER adoption has been developed (Bossu et al., 2016). Similarly, Julien et al. (2018) emphasise the

importance of sustained financial support at the national level to ensure the long-term success and sustainability of OER projects.

Cost reduction: The potential for cost reduction is another powerful driver of OER innovation. Reducing educational costs, particularly for students, is a primary motivation for the development and adoption of OER. Various studies highlight the financial benefits of OER, such as Blomgren (2018) and Brandle (2022), who point out that lowering costs is a key incentive for institutions and educators to implement OER. Initiatives like the "Z degree", which aims to eliminate textbook costs for students, are driven by this cost-reduction objective (Pitt et al., 2020; Ren, 2019; Stanberry, 2022; Sweet & Clarage, 2020; Thomas & Bernhardt, 2018; Todorinova & Wilkinson, 2020).

Reuse of resources: Another significant driver of OER innovation is the reuse of educational resources, which can lead to both cost savings and professional development opportunities for educators. Hood and Littlejohn (2017) argue that educators who engage in the reuse of OER not only contribute to reducing educational costs but also benefit from professional learning through their interactions with these resources. This engagement with OER in their work contexts helps adult educators improve their teaching practices and develop new skills, thus driving further investment in OER initiatives. Kosmas et al. (2021) also support this view, emphasising the importance of resource reuse as a sustainable approach to OER adoption.

4.4.2 Barriers

Funding: One of the most significant barriers to OER innovation is the challenge of securing adequate funding. High capital startup costs are a major hurdle, as noted by Dutta (2016). This initial financial burden can deter institutions from investing in OER projects. Moreover, the ongoing production of OER often relies heavily on institutional funding, creating a dependency that can jeopardise the sustainability of these resources (Santos-Hermosa et al., 2017). Without consistent and reliable funding streams, the continuity and expansion of OER initiatives are at risk.

Resourcing: Economic constraints further exacerbate the challenges associated with OER innovation. In contexts like Vietnam, as highlighted by Truong et al., (2021), limited financial resources can significantly hinder the development and adoption of OER. Another key resourcing issue is the non-obvious costs related to OER implementation, such as the time and effort required to locate, customise, and integrate OER into existing educational practices. Pande (2018) and Wiley et al. (2016) emphasise that these hidden costs, including managing open licence compatibility and integrating OER into campus technologies, add substantial resourcing demands that are often underestimated. Educators frequently struggle with the lack of sufficient time for reflective practice, which is crucial for effectively adopting and integrating OER into their teaching (Masterman, 2016). The pressures associated with time and quality during the creation and customisation of OER are also notable barriers, as discussed by Nagashima and Hrach (2021). Additionally, the need for IT training, as identified by Kinyua (2021), underscores the importance of technical skills in overcoming resourcing challenges. While OER adoption has the potential to save time in the long run, the immediate resourcing demands can be challenging, especially when initial project funding is depleted and OER needs to become a routine part of operations. This can pose particular problems for accessibility (Coughlan et al., 2019).

4.4.3 Enablers

Funding models: Financial incentives, such as stipends and grants, play a critical role in encouraging the adoption and creation of OER. Financial incentives for faculty members who adopt OER are highlighted as effective motivators (Smirani & Boulahia, 2022; Zaid & Alabi, 2021). Additionally, grants and awards can provide the necessary resources to develop new OER materials, as seen in initiatives supported by Kimball et al. (2022). State support also significantly contributes to the sustainability of OER, with examples from various regions showing how state-level initiatives can drive widespread adoption (Anderson et al., 2021; Katz, 2019). Such financial backing is often essential for initiating and maintaining OER projects.

Institutional support: This can have multiple forms, from increasing resources for school children (Mengual-Andrés & Rico, 2018) to organising adequate support for the ICT, legal, and educational aspects of OER implementation (Otto, 2019; Schuwer & Janssen, 2018). Supporting localisation efforts, as noted by Judith and Bull (2016), ensures that OER materials are culturally and contextually relevant, which is key to their successful adoption. Additionally, Senn et al. (2022) suggest that support structures can be aligned with the OER life cycle, helping at every stage—from searching and evaluating resources to adapting, using, and sharing them. Virtual support structures also offer a flexible and scalable means of providing ongoing assistance to educators and institutions (Sungkur & Santally, 2019).

4.5 Technology and infrastructure

4.5.1 Drivers

Access to technology: Reliable internet access is fundamental for the use and distribution of OER. In regions where internet connectivity is limited this remains a significant barrier. However, as noted by Kinyua (2021) and Dutta (2016), there is a growing accessibility to smart technologies, even in these regions, which is gradually expanding the potential reach of OER.

Compatibility/interoperability: Another identified driver is the compatibility and interoperability of OER across different platforms and devices (Abdulameer & Abdullah, 2020; Blackmon, 2018; Choudhury, 2018; Kopp et al., 2017). The ability to use OER in various formats and on different devices is essential but a lack of standardisation often creates challenges (Choudhury, 2018; Kopp et al., 2017). This issue has spurred efforts to develop simpler and more universally compatible ways to share learning resources, which is seen as a key innovation in the field of OER (Dix et al., 2016).

4.5.2 Barriers

Infrastructural barriers: Inadequate technological infrastructure remains a fundamental impediment to the effective implementation of OER. Studies have highlighted the scarcity of reliable technological frameworks in various regions, which hampers access and utilisation (Abeywardena, 2017; Abeywardena et al., 2018; Alkhasawneh, 2020; Datt & Singh, 2022; MacKinnon & Pasfield-Neofitou, 2016; Venegas Muggli & Westermann, 2019; Wiche & Ogunbodede, 2021; Wong & Li, 2019). Additionally, the lack of affordable technology and consistent energy supply further exacerbates the issue, making it challenging for educators and learners to engage with OER effectively (Kinyua, 2021). The absence of widespread internet access is another critical barrier, with several studies pointing out the limitations this imposes on OER dissemination (Afolabi, 2017; Datt & Singh, 2022; Mays et al., 2021; Singh et al., 2021; Wiche & Ogunbodede, 2021). In regions where mobile and internet coverage is sparse, the problem is even more pronounced (Mays, 2020). Moreover, the phenomenon of platformisation, where platforms

dominate the digital space, can limit the diversity and accessibility of OER (Jacqmot et al., 2020). Technological readiness is unevenly distributed across different regions and institutions, leading to disparities in OER adoption (Jemni & Khribi, 2016).

Sociotechnical barriers: Sociotechnical challenges encompass issues that arise from the intersection of social and technical systems. Accessibility stands out as a significant concern, with many OER platforms and resources not adequately catering to users with special needs (Abdulameer & Abdullah, 2020; Navarrete & Lujan-Mora, 2016; Romero Peláez & Yunga, 2016; Tlili et al., 2020). Institutional repositories, while intended to centralise resources, can inadvertently become silos, limiting broader dissemination and reuse (Perifanou & Economides, 2022a; Piedra et al., 2016; Risquez et al., 2020). A lack of technological support within institutions may leave educators without the necessary assistance to navigate OER platforms and tools (Alkhasawneh, 2020). Additionally, many OER repositories suffer from being non-user-friendly, deterring potential users due to complex interfaces or navigation issues (Guzmán-Arias et al., 2019; Otto et al., 2021). External barriers such as paywalls and mandatory account creation can also restrict access (Chan et al., 2020; Kinyua, 2021). Poor implementation of OER within Learning Management Systems (LMS) further hinders seamless integration into educational curricula (Horn et al., 2018). Challenges also arise in promoting equal and uniform engagement among users (Arnett, 2018), and there's a noted lack of consideration by creators to support the reuse of OER (Kinyua, 2021). Technical challenges, in a broader sense, encompass a range of issues from system glitches to inadequate support structures (Breathnach et al., 2021; Datt & Singh, 2022; Truong et al., 2021).

Technological barriers: Users often find it difficult to locate relevant OER due to inefficient search mechanisms and poorly organised repositories (Cortinovis et al., 2019; Iniesto et al., 2021; Perifanou & Economides, 2022a). This is compounded by inadequate or non-systematic metadata, which hampers the categorisation and retrieval of resources (De Deus & Barbosa, 2022). Furthermore, many educators and learners possess insufficient technological skills, making it challenging to navigate OER platforms or customise resources to fit their needs (Afolabi, 2017; Axe et al., 2020; Zhu & Kadirova, 2020). Interoperability issues arise when OER cannot seamlessly integrate across different platforms or systems, limiting their utility (Herrera-Cubides et al., 2022). Metadata challenges, including inaccuracies or inconsistencies, further impede the effective use and sharing of OER (Abdulameer & Abdullah, 2020). Some repositories are noted to be slow and contain inaccurate metadata, detracting from user experience and trust (Perifanou & Economides, 2022b). Additionally, certain publishing platforms do not accommodate OER, restricting the avenues through which these resources can be disseminated (Essmiller & Asino, 2021).

4.5.3 Enablers

Accessibility and usability: Ensuring that OER repositories are designed to be accessible to users with special needs is critical for broadening participation in open education (Hajri et al., 2018; Iniesto et al., 2021; Perifanou & Economides, 2022b). Effective metadata and user-friendly interfaces, including easy search, classification, and download functions, further enhance the usability of these resources (Chan et al., 2020; Pounds & Bostock, 2019). The usability of OER tools, which includes intuitive design and accessibility features, is also crucial for ensuring that educators and learners can effectively engage with OER (Schön et al., 2017; Sunar et al., 2020; Tammaro et al., 2017; Vollman, 2021).

Open infrastructure and ecosystems: Centralised OER repositories, which aggregate resources in a single, accessible location, play a vital role in promoting the widespread use and reuse of OER (Schuwer & Janssen, 2018). These repositories often operate within complex technological frameworks that incorporate systems for quality assurance, user feedback, motivation, and

reusability (Abdulameer & Abdullah, 2020; Anderson et al., 2021; de Jong et al., 2019). The openness of these ecosystems is linked to better educational outcomes, as they facilitate greater accessibility and encourage the reuse of resources (Santos-Hermosa et al., 2017). The integration of Web 2.0 ecosystems supports collaborative and participatory approaches to OER creation and sharing (Lima-Lopes & Biazi, 2021).

Interoperability and integration: Interoperability and integration are crucial for the seamless use of OER across different platforms and systems. Ensuring that educational resources are interoperable allows them to be used across various LMS and other educational platforms, which enhances their utility and reach (Brandle, 2018). The integration of OER is facilitated by the use of linked data, which helps connect resources and make them more discoverable and usable (Herrera-Cubides et al., 2022). Linked Open Data, in particular, is instrumental in creating interconnected networks of educational resources that can be easily accessed and used across different systems (Cortinovis et al., 2019; Mosharraf & Taghiyareh, 2016; Piedra et al., 2016).

Digitalisation and emergent technologies: The role of digitalisation and emergent technologies in enabling OER innovation cannot be overstated. Advances in OER software architecture have made it possible to develop more sophisticated and user-friendly platforms (Stefanović & Milošević, 2016). Emerging technologies like blockchain are being explored for their potential to track OER usage, ensure proper attribution, and support the sustainability of these resources (Marjit & Kumar, 2020). The increasing use of digital devices in educational settings also supports the integration of OER into everyday learning (Mazohl et al., 2018). Furthermore, the application of new technologies, such as artificial intelligence and machine learning, offers innovative solutions to some of the challenges associated with OER, including personalisation and the automatic generation of metadata (Tlili et al., 2021).

4.6 Policy and Culture

4.6.1 Drivers

Policy: Institutional policies that govern the use of OER and open licences are significant drivers of innovation (Abeywardena, 2017; Baas et al., 2023; Chotto & Rivera, 2017; Kumar et al., 2021; Kwak, 2017; Pande, 2019; Risquez et al., 2020; Rolfe, 2017; Tlili et al., 2020). Additionally, policies that incentivise OER activities play a crucial role in promoting adoption and innovation (Abeywardena, 2017; Anderson et al., 2021; Baas et al., 2022b; Baas et al., 2019; Baran & AlZoubi, 2020; Christoforidou & Gerogiadou, 2021; Kwak, 2017). Strategic approaches to knowledge production and dissemination are also vital components of this policy-driven innovation (Ramirez-Montoya, 2020).

OER alignment: OERs are increasingly being aligned with key educational components such as assessments (Abdulameer & Abdullah, 2020; Ayoub et al., 2020; Baas et al., 2022; Baran & AlZoubi, 2020), courses (Abdulameer & Abdullah, 2020; Ayoub et al., 2020; Luo et al., 2020), and learning outcomes (Abeywardena, 2017; Baas et al., 2022). This alignment enhances the relevance and effectiveness of OER in educational settings.

Localisation: Localisation efforts are essential to make OERs more relevant to diverse audiences. This includes accounting for regional differences (Jung & Hong, 2016), contextualisation of content (Karunanayaka et al., 2016), and providing OER in local languages (Abeywardena et al., 2018; Cinganotto & Cuccurullo, 2016; Kosmas et al., 2021; Kwak, 2017).

4.6.2 Barriers

Policy gaps: Barriers to OER innovation often stem from a lack of sustainable development policies for OER (Yang & Kinshuk, 2016). Legal and legislative limitations (Truong et al., 2021; Wright et al., 2016) further complicate the adoption process. Additionally, even when policies exist, they do not always result in the effective adoption of OER (Schuwer & Janssen, 2018), creating a noticeable policy gap (Bossu et al., 2016).

Institutional approach: Institutional challenges include competition among institutions and educators (Pounds & Bostock, 2019) and a tendency toward institutional conservatism (Cooke et al., 2022; Coughlan et al., 2019). The culture within institutions (Masterman, 2016) and the diversity of institutional strategies (Orr et al., 2019) also act as barriers. Moreover, some institutions support proprietary resources over OER (Coughlan et al., 2019), and there is often a lack of academic recognition for those involved in OER development (Afolabi, 2017; Kumar et al., 2021). This is compounded by insufficient institutional support (Alkhasawneh, 2020; Kimball et al., 2022) and the exclusion of student perspectives (Bossu et al., 2016).

Change management: Barriers related to change management include issues with communication (Towey & Zhao, 2017) and inconsistencies in approaches (Jiménez-Castañeda et al., 2019). The difficulty in organising and coordinating efforts (Breathnach et al., 2021) is also a significant challenge. Additionally, there is often a lack of awareness among stakeholders about the benefits of OER (Schuwer & Janssen, 2018), and OER usage is sometimes imposed from the top down (Cox & Trotter, 2016). Successfully navigating a paradigm shift requires a holistic, comprehensive approach (Bonami et al., 2020), and aligning expectations can be difficult (Ponte et al., 2021).

4.6.3 Enablers

National strategy: National strategies, as highlighted by Bossu et al. (2016) and Karipi et al. (2022), seem to play a crucial role in driving uptake of OER.

Professional support: Additionally, Brandle (2022) emphasises the importance of professional bodies promoting OER to foster a more supportive culture around its use. These strategies can integrate OER policies into broader educational frameworks, supporting initiatives like the transition to blended learning and enhancing the customisation of education for individual learners, as discussed by Schuwer and Janssen (2018).

Alignment with equity, diversity, inclusion: In terms of alignment with equity, diversity, and inclusion (EDI), policy changes can drive significant advancements. Mays (2020) underscores the importance of decolonising the curriculum, a process that can be supported through strategic policy shifts. Similarly, Stanberry (2022) notes that OER can be a powerful tool in fulfilling EDI strategies within educational institutions.

5 Discussion: How can OER innovation be enabled?

Other authors have reported about the many facets of OER (Bossu et al., 2012; Smith & Casserly, 2006; Tlili, et al., 2022; Wiley et al., 2014). One issue in situating our review relative to other studies is the lack of consistent language and terminology relating to the innovational aspects of OER which we have addressed directly. This review synthesised a range of drivers, barriers and enablers related to innovation with OER, as reported in literature (n = 210) since 2015. The vast majority of resources referred to in this study connect to a particular socioeconomic, cultural and historical context, with the term 'innovation' having been used ambiguously in the literature. The research identified examples where OER is being introduced to a new audience as an innovation behaviour. We differentiate this from an interest in OER as a driver of innovation and change within a particular context. This second sense reflects a more mature, experimental perspective on the potential of OER and is the focus for the study, but there is no obvious way to differentiate these two senses when reviewing scientific literature tagged with both 'OER' and 'innovation'. Similarly, the drivers, barriers and enablers associated with OER innovation are often presented in relation to adoption rather than OER enabled innovation behaviours, and it can be challenging to distinguish factors driving the adoption of OER from those supporting downstream innovation behaviours.

Due to the large number of results, the approach taken was to extract only brief descriptions of relevant factors and integrate these through synthesis (see Table 1). Key drivers of OER innovation are closely tied to their role in enhancing educational access, reducing student costs, and responding to increased demand for online education. Enablers here encompass a broad range of factors, including community engagement, strategic planning, and robust support systems. The complexity of enacting change and developing strategies for OER delivery is evident, with challenges in adapting, localising, and integrating OER. These issues are prominent not only at a broad strategic and cultural level but also within specific institutional contexts, where the concrete implementation and evaluation of OER face notable obstacles. Much seems to depend on local strategies for information and awareness, where we record many barriers but also many enablers. Another significant cluster of enablers relates to the specific forms of support provided for the teaching and learning process. Enablers gravitate towards innovative pedagogical practices, perspective changes, and pedagogical support, all of which contribute to the effective integration and use of OER in educational settings.

The importance of developing positive attitudes and increased awareness of OER and OEP is highlighted by many studies. At the strategic level, key enablers of innovation include institutional vision and the willingness to embrace change, positioning OER as a crucial component of higher education innovation or digitalisation strategies. Effective advocacy, a clear strategic vision, and comprehensive support and resources are integral to fostering OER adoption and integration in educational contexts. The role of libraries and other campus services is often highlighted as central to this support, frequently leading to adjustments in how these services are provided. Resourcing and sustainability remain key challenges for OER, and without any obvious solution. The availability of funding, particularly at the national level, remains key to the development and adoption of OER. The barriers to OER innovation related to resourcing and sustainability are multifaceted and deeply intertwined with funding challenges. Financial incentives, grants, and state support can drive the long-term success of OER projects, but equally important is comprehensive institutional support, which encompasses technical, legal, and educational resources.

Table 1: Thematic Summary of Drivers, Barriers and Enablers for OER Innovation

	Drivers	**Barriers**	**Enablers**
Structural, Systemic & Contextual Factors	Access & Equity Strategy; Reducing Costs; Knowledge & Learning; Responding to Crisis and Disruption	Aligning Strategy for OER Adoption; Shaping Institutional Practice; Navigating Cultural and Global Realities; Implementing OER and Assessing Impact	Community Engagement and Advocacy; OER Strategy; Support and Resources
Pedagogical Practice	Collaboration Catalysis; Improve Learning Outcomes; Institutional Culture; Pedagogical Enhancement;	Curriculum Integration; Educator Engagement; Implementation; Localisation	Innovative Practice; Perspective Change; Pedagogical Support
Information, Awareness & Attitude	Attitudinal Change; Awareness of OER/OEP	Access; Encultured Practice; Low Awareness; Knowledge & Impact; Quality & Trust	Educator Mindset; Empowered Vision Knowledge Base; Quality Feedback Mechanisms; Stakeholder Engagement
Resourcing & Sustainability	Funding Streams; Reducing Costs	Funding; Resourcing; Sustainability	Capacity Building; Funding Models; Institutional Support;
Technology & Infrastructure	Access to Technology; Compatibility/Interoperability	Infrastructural; Sociotechnical; Technological	Accessibility and Usability; Digitalisation & Emergent Technologies; Interoperability and Integration; Open Infrastructure/Ecosystem
Policy & Culture	Attitudinal Change; Awareness of OER/OEP	Policy Gap; Institutional Approach; Change Management	National; Strategic; Alignment with Equity, Diversity and Inclusion

The visibility of materials and the challenge of identifying appropriate resources are significant factors that can hinder OER use. Moreover, even when suitable resources are identified, the potential for reuse can be constrained by the pedagogical approach or learning design of the OER in question. An open ecosystem for technology and infrastructure can play a pivotal role in driving innovation with OER, but there are many examples of infrastructural, sociotechnical and technological barriers to OER innovation. Enablers in this category contribute to making these OER more accessible, usable, and integrated within educational systems. Enabling factors often involve extending conversations into new stakeholder relationships; reformation of institutional or pedagogical practice; and developing enculturation around the use of OER.

Policy is consistently highlighted as a key driver of OER activity in various studies, demonstrating the importance of top-down directives as a motivator. The two most common policy approaches are mandating open licences for institutional work or directly incentivising OER activity, both of which foster an environment conducive to innovation. More granular drivers include integrating OER into core institutional activities like course delivery and assessment. Policy barriers are varied, often reflecting challenges associated with localisation. The first cluster of barriers highlights a gap between aspiration and implementation. The second cluster relates to institutional approaches, revealing how institutions can struggle to adapt to open practices. The final cluster focuses on the challenges of managing change. While relatively few enablers were identified, a focus on re-strategisation is suggested. While policy solutions are often localised, these enablers highlight the potential for national strategies and policy alignment to drive innovation and cultural change.

This study exhibits several important limitations. Firstly, it is possible that important pieces of literature were omitted because of the way that resources were selected from a specific period, by using certain key phrases, or through excluding some scientific databases. All the items reviewed were published in English. The findings of the study are an abstraction and shorthand description of a range of possibilities that have been described by others and not a roadmap to innovation. The results presented here should be understood as an interpretation of the data set. Other interpretations are possible (and may indeed be preferable). It is inevitable that some nuance from the original works is lost in the process of synthesis. The emphasis of this study is on wider systematic and structural features, meaning that descriptions of contextual relevance and importance are not part of the reporting even when they might be essential to understanding a particular case.

6 Conclusion

The vast majority of literature and resources referred to in this study relate to particular socioeconomic, cultural and historical contexts. In this study we have attempted to derive from these a generalised understanding of the drivers, barriers, challenges and enablers of OER innovation. Our research question asked: how do relevant stakeholders understand the drivers, barriers and enablers relating to innovation with OER? Through our synthesis, we have shown the following:

- Many studies refer to 'innovation' in ambiguous ways. It would be easier to learn from examples of OER innovation if future case studies carefully strive for more consistent forms of description (language, terminology, concepts, models).
- Drivers of OER adoption are often in service of another goal, such as improving access, reducing cost, or improving learning outcomes.
- Many OER implementations seem to experience innovation barriers when attempting to bring the proposition of OER to a new context, requiring institutional change or pedagogical adaptation.
- Outside English-speaking countries, translation and localisation remain highly significant barriers to innovation.
- There are many barriers and enablers which relate to information and awareness, suggesting that these could be key to unlocking innovative practice; however, these can be highly contextual.
- Many enablers of innovation emphasise greater openness in terms of pedagogical practice, technologies and community engagement.
- Since many enabling factors involve interplay between stakeholders, holistic accounts of OER innovation which focuses on wider networks may be helpful.

- Aspects of diversity, equity, inclusion and accessibility are referenced at varying levels of importance but seem relevant to innovation.
- Although "necessity is the mother of invention", sustainable business models for OER are not established, and resourcing remains an issue for would-be innovators.

While this study has identified thematic clusters and patterns in the literature pertaining to innovation with and through OER, the inductive logic of the study could be seen to limit its applicability. We have not attempted to theorise OER innovation (since this is outside of scope) but the data we have presented could form the basis of new conceptual models. Future studies could assess the validity of these clusters empirically by linking them to contexts of application and predicting the kinds of barriers, enablers and drivers that might apply. Similarly, the clustering could be iterated through additional empirical data in the form of case studies or subsequent literature reviews.

References

Abdulameer, M. H. & Abdullah, M. Z. (2020). Recent techniques of open educational resources. In *2019 Imam Al-Kadhum International Conference for Modern Applications of Information and Communication Technology, MAICT 2019.* Institute of Physics Publishing. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85086408886&doi=10.1088%2f1742-6596%2f1530%2f1%2f012031&partnerID=40&md5=8e0a369fabae756854f6f2bbca077f16.

Abeywardena, I. S. (2017). An empirical framework for mainstreaming OER in an academic institution. *Asian Association of Open Universities Journal, 12*(2), 230-242. https://doi.org/10.1108/AAOUJ-11-2017-0036

Abeywardena, I., Karunanayaka, S., Nkwenti, M. & Tladi, L. (2018). A collaborative approach to OER policy and guidelines development in the Commonwealth: The Case of Botswana, Cameroon, and Sri Lanka. *International Review of Research in Open and Distributed Learning*, *19*(2), 71-88. https://doi.org/10.19173/irrodl.v19i2.3415

Afolabi, F. (2017). First year learning experiences of university undergraduates in the use of open educational resources in online learning. *The International Review of Research in Open and Distributed Learning*, *18*(7), 112-125. https://doi.org/10.19173/irrodl.v18i7.3167

Alario-Hoyos, C., Estévez-Ayres, I., Pérez-Sanagustín, M., Delgado Kloos, C., & Fernández-Panadero, C. (2017). Understanding learners' motivation and learning strategies in MOOCs. *The International Review of Research in Open and Distributed Learning*, *18*(3), 119-137. https://doi.org/10.19173/irrodl.v18i3.2996

Alkhasawneh, S. (2020). Perception of academic staff toward barriers, incentives, and benefits of the open educational resources (OER) network (SHMS) at Saudi Universities. *Italian Journal of Sociology of Education*, *12*(1), 211-225. https://ijse.padovauniversitypress.it/2020/1/12

Almazyad, R. (2019). Enhancing the quality and reliability of OER Content. In *Eighth International Conference on Educational Innovation through Technology (EITT)* (pp. 35-38). Institute of Electrical and Electronics Engineers Inc. MS, USA. https://doi.org/10.1109/EITT.2019.00016

Anderson, T. R., Kelly, S. M., & Lynch, K. (2021). Z-Degrees: four colleges in 12 Months. *Journal of Higher Education Theory and Practice*, *21*(5), 131-142. https://doi.org/10.33423/jhetp.v21i5.4275

Andone, D., & Vasiu, R. (2016). MOOCs in higher education—flipped classroom or a new smart learning model?. In Y. Li, M. Chang, M. Kravcik, E. Popescu, R. Huang, & N.-S. Chen (Eds.),

State-of-the-Art and Future Directions of Smart Learning (pp. 303–307). Springer. https://doi.org/10.1007/978-981-287-868-7_37

Andone, D., Mihaescu, V., Vert, S., Ternauciuc, A. & Vasiu, R. (2020). Students as OERs (Open Educational Resources) co-creators. In: *IEEE 20th International Conference on Advanced Learning Technologies (ICALT)*, Tartu, Estonia, 2020, 34-38. https://doi.org/10.1109/ICALT49669.2020.00017

Andrade, A., Caine, A., Carneiro, R., Conole, G., Ehlers, U.D., Holmberg, C., Kairamo, A.-K., Koskinen, T., Kretschmer, T., Moe-Pryce, N., Mundin, P., Nozes, J., Reinhardt, R., Richter, T. & Silva, G. (2011). Beyond OER: Shifting focus from resources to practice. Open Education Quality Initiative. http://duepublico.uni-duisburg-essen.de/servlets/DerivateServlet/Derivate-25907/OPALReport2011_Beyond_OER.pdf

Arnett, E. J. (2018). If you build it, will they come?: Research into students' use of an open educational resource in technical communication. In *IEEE International Professional Communication Conference (ProComm)*, Toronto, ON, Canada, 2018, 207-21. https://doi.org/10.1109/ProComm.2018.00048

Axe, J., Childs, E., DeVries, I., & Webster, K. (2020). Student experiences of open educational practices: a systematic literature review. *Journal of E-Learning and Knowledge Society*, *16*(4), 67-75. https://doi.org/10.20368/1971-8829/1135340

Ayoub, A., Amin, R. & Wani, Z.A. (2020). Contribution of developed countries towards MOOCs: an exploration and assessment from a representative platform Coursera. *Asian Association of Open Universities Journal, 15*(2), 251-262. https://doi.org/10.1108/AAOUJ-03-2020-0016

Baas, M., Admiraal, W., & van den Berg, E. (2019). Teachers' adoption of open educational resources in higher education. *Journal of Interactive Media in Education, 2019*(1). https://doi.org/10.5334/jime.510

Baas, M., van der Rijst, R., Huizinga, T., van den Berg, E. & Admiraal, W. (2022). Would you use them? A qualitative study on teachers' assessments of open educational resources in higher education. *Internet and Higher Education*, *54*. https://doi.org/10.1016/j.iheduc.2022. 100857

Baas, M., Schuwer, R., van den Berg, E., Huizinga, T., van der Rijst, R. & Admiraal W. (2023). The role of brokers in cultivating an inter-institutional community around open educational resources in higher education. *Higher Education 85*, 999–1019. https://doi.org/10.1007/s10734-022-00876-y

Baran, E., & AlZoubi, D. (2020). Affordances, challenges, and impact of open pedagogy: examining students' voices. *Distance Education*, *41*(2), 230-244, https://doi.org/10.1080/01587919.2020.1757409

Ben Brahim, H., Khribi, M.K. & Jemni, M. (2018). Towards accessible open educational resources: Overview and challenges. In *Proceedings of the 6th International Conference on Information and Communication Technology and Accessibility (ICTA)*, Muscat, Oman, 19–21 December 2017. https://ieeexplore.ieee.org/document/8336068

Bencheva, N. & Kostadinov, N. (2019). Through STEM education and OER to attract the girls in ICT career. In *29th Annual Conference of the European Association for Education in Electrical and Information Engineering, EAEEIE 2019*. Institute of Electrical and Electronics Engineers Inc. http://dx.doi.org/10.1109/EAEEIE46886.2019.9000472

Blackmon, S. (2018). MOOC makers: Professors' experiences with developing and delivering MOOCs. *International Review of Research in Open and Distributed Learning, 19*(4), 76–91. https://doi.org/10.19173/irrodl.v19i4.3718

Blomgren, C. (2018). OER awareness and use: the affinity between Higher Education and K-12. *The International Review of Research in Open and Distributed Learning, 19*(2). https://doi.org/10.19173/irrodl.v19i2.3431

Bodily, R., Nyland, R., & Wiley, D. (2017). The RISE Framework: using learning analytics to automatically identify Open Educational Resources for continuous improvement. *The International Review of Research in Open and Distributed Learning*, *18*(2). https://doi.org/10.19173/irrodl.v18i2.2952

Bohrer, E., Nakayma, M. K., Silveira, R. A., & de Cassia Clark Teodoroski, R. (2016). Initiatives and experiences in Open Educational Resources (OER) in higher education: A reflective roadmap. IEEE. https://doi.org/10.1109/siie.2016.7751863

Bonami, B., Nocenzi, M., & Passarelli, B. (2020). Qualitative analysis of digital technology research and practice in the field of social and human Sciences. *Journal of E-Learning and Knowledge Society*, *16*(3), 50-59. https://doi.org/10.20368/1971-8829/1135241

Bossu, C., Bull, D., & Brown, M. (2012). Opening up down under: the role of open educational resources in promoting social inclusion in Australia. *Distance Education*, *33*(2), 151–164. https://doi.org/10.1080/01587919.2012.692050

Bossu, C., Ellis, D. (2023). Open Educational Practice as an enabler for Virtual Universities. In: Sankey, M.D., Huijser, H., Fitzgerald, R. (Eds.) *Technology-Enhanced Learning and the Virtual University*. University Development and Administration. Springer, Singapore. https://doi.org/10.1007/978-981-19-9438-8_21-1

Bossu, C., Ward, L., Wills, S., Alexander, S., Sadler, D., Kandlbinder, P., Brown, N., Chelliah, J., Klapdor, K., & Uys, U. (2016). A national strategy to promote open educational practices in higher education in Australia. In *33rd International Conference of Innovation, Practice and Research in the Use of Educational Technologies in Tertiary Education*. Australasian Society for Computers in Learning in Tertiary Education. http://ecite.utas.edu.au/112975

Brahim, H. B., Khribi, M .K., Jemni, M., Tlili, A. (2020). Promoting inclusive open education: a holistic approach towards a novel accessible OER recommender system. In Miesenberger, K., Manduchi, R., Covarrubias Rodriguez, M., Peňáz, P. (Eds.) *Computers Helping People with Special Needs. ICCHP 2020.* Lecture Notes in Computer Science (Vol. 12377*)*. Springer, Cham. https://doi.org/10.1007/978-3-030-58805-2_20

Brandle, S. M. (2018). Opening up to OERs: electronic original sourcebook versus traditional textbook in the Introduction to American Government course, *Journal of Political Science Education*, *14*(4), 535-554. https://doi.org/10.1080/15512169.2017.1420482

Brandle, S. M. (2022). The book costs how much??? Textbook cost & oer awareness in political science. *Journal of Political Science Education*, *18*(4), 555-569. https://doi.org/10.1080/15512169.2022.2104164

Breathnach, C., Murphy, R. & Margaria, T. (2021). Transcribathons as practice-based learning for historians and computer scientists. In *2021 IEEE 45th Annual Computers, Software, and Applications Conference (COMPSAC)*, (pp. 1131-1136). IEEE. https://doi.org/10.1109/COMPSAC51774.2021.00155

Buckler, A., Stutchbury, K., Kasule, G., Cullen, J., & Kaije, D. (2021). What prevents teacher educators from accessing professional development OER Storytelling and professional identity in Ugandan teacher colleges. *Journal of Learning for Development*, *8*(1), 10–26. https://doi.org/10.56059/jl4d.v8i1.493

Burgos, D. & Corbí, A. (2018). Transgenic learning for STEAM subjects and virtual containers for OER. *Distance Education*, *39*(1), 4-18. https://doi.org/10.1080/01587919.2018.1429894

Chan, H. C. B., Ho, Y. H., Tovar, E. & Reisman, S. (2020). Enhancing the learning of Computing/IT students with Open Educational Resources. In *2020 IEEE 44th Annual Computers, Software, and Applications Conference (COMPSAC)*, (pp. 113-122). https://doi.org/10.1109/COMPSAC48688.2020.00024

Chan, H. C. B., Kemp, I. M., Leung, W. C. L., Tovar, E., & Reisman, S. (2021). Enhancing student learning through an open educational resource competition. In W. K. Chan, B. Claycomb, H. Takakura, J-J. Yang, Y. Teranishi, D. Towey, S. Segura, H. Shahriar, S. Reisman, & S. I. Ahamed (Eds.), *Proceedings - 2021 IEEE 45th Annual Computers, Software, and Applications Conference, COMPSAC 2021*, (pp. 127-132). IEEE. https://doi.org/10.1109/COMPSAC51774.2021.00029

Chotto, M. C., & Rivera, S. M. (2017, September). To what extent are faculty ready to participate in the OER movement?: The case of the Informatics School, UNA. In *2017 XLIII Latin American Computer Conference (CLEI)* (pp. 1-8). IEEE. https://doi.org/10.1109/CLEI.2017.8226379

Choudhury, B. R. (2018). Openness in higher education through open and distance learning environment. *In 2018 5th International Symposium on Emerging Trends and Technologies in Libraries and Information Services (ETTLIS)*, (pp. 221-225). IEEE. https://doi.org/10.1109/ETTLIS.2018.8485203

Christoforidou, A., & Georgiadou, E. (2021). Awareness and use of oer by higher education students and educators within the graphic arts discipline in Greece. *Education Sciences, 12*(1), 16. MDPI AG. http://dx.doi.org/10.3390/educsci12010016

Cinganotto, L. & Cuccurullo, D. (2016). Open educational resources, ICT and virtual communities for content and language integrated learning. *Teaching English with Technology*, *16*(4), pp.3-11. https://files.eric.ed.gov/fulltext/EJ1135659.pdf

Cooke, R., Rivera, K. & Rokusek, S. (2022). Connecting adjuncts to the library: hosting online sessions to increase awareness of OER, E-books, and other library resources. *Journal of Academic Librarianship*, 48(5). https://doi.org/10.1016/j.acalib.2022.102571

Cooney, C. (2017). What impacts do oer have on students? Students share their experiences with a health psychology OER at New York City College of Technology. *International Review of Research in Open and Distributed Learning, 18*(4), 155–178. https://doi.org/10.19173/irrodl.v18i4.3111

Cortinovis, R., Mikroyannidis, A., Domingue, J., Mulholland, P. & Farrow, R. (2019). Supporting the discoverability of open educational resources. *Education and Information Technologies*, *24*(5), pp.3129-3161. https://doi.org/10.1007/s10639-019-09921-3

Coughlan, T., Pitt, R. & Farrow, R. (2019). Forms of innovation inspired by open educational resources: a post-project analysis. *Open Learning: The Journal of Open and Distance Learning 34*(2), 156-175. https://doi.org/10.1080/02680513.2018.1552579

Cox, G. & Trotter, H. (2016). Institutional culture and OER policy: how structure, culture, and agency mediate OER policy potential in South African Universities. *International Review of Research in Open and Distributed Learning*, *17*(5), 147–164. https://doi.org/10.19173/irrodl.v17i5.2523

Cozart, D., Horan, E. M., & Frome, G. (2021). Rethinking the traditional textbook: a case for open educational resources (OER) and no-cost learning materials. *Teaching and Learning Inquiry*, *9*(2). https://doi.org/10.20343/teachlearninqu.9.2.13

Craig, C. D. (2020). 2020 pandemic: Resilient Canadian higher education institutions will integrate OER. In N. Callaos, B. Muirhead, L. Robertson, B. Sanchez, & M. Savoie (Eds.), *Proceedings of the 14th International Multi-Conference on Society, Cybernetics and Informatics (IMSCI 2020)* (pp. 149–153). International Institute of Informatics and Systemics (IIIS).

Datt, G. & Singh, G. (2022). Acceptance and barriers of open educational resources in the context to Indian higher education. *Canadian Journal of Learning and Technology, 47*. http://dx.doi.org/10.21432/cjlt28028

Daukšienė, E., Trepulė, E., Volungevičienė. A., Šadauskas, M. & Ehlers, U. (2020). How to become an open educator?. *Journal of E-Learning and Knowledge Society, 16*(2), 51-60. https://doi.org/10.20368/1971-8829/1135182

De Deus, W. S. & Barbosa, E. F. (2022). A systematic mapping of the classification of open educational resources for Computer Science education in digital sources. *IEEE Transactions on Education*, *65*(3), 450-460. https://doi.org/10.1109/TE.2021.3128019

de Jong, M., Munnik, M., & Will, N. (2019). Innovation opportunities for academic libraries to support teaching through open education: A case study at TU Delft, the Netherlands. *New Review of Academic Librarianship*, *25*(2-4), 392-407. https://doi.org/10.1080/13614533.2019.1621185

Delgado, H., Delgado, M., & Hilton III, J. (2019). On the efficacy of open educational resources: parametric and nonparametric analyses of a university calculus class. *The International Review of Research in Open and Distributed Learning*, *20*(1). https://doi.org/10.19173/irrodl.v20i1.3892

Dell, D. (2021). Resonance and current relevance of IRRODL highly-cited articles: an integrative retrospective. *The International Review of Research in Open and Distributed Learning, 22*(1), 243–258. https://doi.org/10.19173/irrodl.v22i1.5315

Deshmukh A. and Sahasrabudhe S. (2020). Curating an OER course by applying the learner-centric MOOC model. In H. J. So et al. (Eds.), *Proceedings of the 28th International Conference on Computers in Education* (Vol. 2, pp. 349–357). Asia-Pacific Society for Computers in Education (APSCE).

DeVries, I. J. (2015). Community volunteers in collaborative OER development. In *Proceedings of the 32nd Annual Conference of the Australasian Society for Computers in Learning and Tertiary Education (ASCILITE)* (pp. 77–88). Australasian Society for Computers in Learning in Tertiary Education (ASCILITE).

Dix, A. (2016). Challenge and potential of fine grain, cross-institutional learning data. In *Proceedings of the Third (2016) ACM Conference on Learning @ Scale* (pp. 213–216). ACM. https://doi.org/10.1145/2876034.2893429

Dix, A., Malizia, A., & Gabrielli, S. (2016). HCI and the educational technology revolution. In *Proceedings of the International Working Conference on Advanced Visual Interfaces* (pp. 368–371). ACM. https://doi.org/10.1145/2909132.2927472

Dreisiebner, S., Polzer, A. K., Robinson, L., Libbrecht, P., Bote-Vericad, J-J., Urbano, C., Mandl, T., Vilar, P., Zumer, M., Juric, M., et al (2021). Facilitation of information literacy through a multilingual MOOC considering cultural aspects. *Journal of Documentation*, 77(3), 777-797. https://doi.org/10.1108/JD-06-2020-0099

Dumbrăveanu, R. (2021). Challenges in the current distance education paradigm. In *eLearning and Software for Education Conference: eLSE 2020*, (Ed. 17, Vol. 1, 433-443, București, România: National Defence University - Carol I Printing House. https://doi.org/10.12753/2066-026X-21-197

Dutta, I. (2016). Open educational resources (OER): opportunities and challenges for Indian higher education. *Turkish Online Journal of Distance Education*, *17*(2). https://dergipark.org.tr/en/download/article-file/222610

Essmiller, K., & Asino, T. (2021). Will academic library publishing break OER? A diffusion of innovations study. *Journal of Interactive Media in Education*, *2021*(1). https://doi.org/10.5334/jime.673

Farrow, R., Pitt, R., & Weller M. (2020). Open textbooks as an innovation route for open science pedagogy. *Education for Information*, *36*(3), 227-245. https://doi.org/10.3233/EFI-190260

Farrow, R., Bossu, C., Iniesto, F., Pitt, R. & Weller, M. (2023). OER innovation report: drivers, barriers, challenges and enablers. European Network for Catalysing Open Resources in Education (ENCORE+). https://encoreproject.eu/2024/02/29/oer-innovation-report/

Ferguson, C. L. (2017). Open educational resources and institutional repositories. *Serials Review*, *43*(1), 34-38. https://doi.org/10.1080/00987913.2016.1274219

Finlayson, C. (2020). Writing and implementing an open textbook in world regional geography: a case study. *The International Review of Research in Open and Distributed Learning*, *21*(4), 245–254. https://doi.org/10.19173/irrodl.v21i4.4756

Fischer, L., Ernst, D., & Mason, S. L. (2017). Rating the quality of open textbooks: how reviewer and text characteristics predict ratings. *The International Review of Research in Open and Distributed Learning*, *18*(4). https://doi.org/10.19173/irrodl.v18i4.2985

Fitriansyah, R., Fatinah, L., & Syahril, M. (2020). Critical review: professional development programs to face Open Educational Resources in Indonesia. Universitas Muhammadiyah Surakarta. https://doi.org/10.23917/ijolae.v2i2.9662

Georgiadou, E., & Kolaxizis, I. (2019). Film students' attitude toward open educational resources (OERs) for Film Studies in Greece. *Education Sciences, 9*(3), 195. MDPI AG. Retrieved from http://dx.doi.org/10.3390/educsci9030195

Gill, A., Irwin, D. S., Ng, R. Y. K., Towey, D., Wang, T., & Zhang, Y. (2020). The future of teaching post-COVID-19: Microlearning in product design education. In H. Mitsuhara, Y. Goda, Y. Ohashi, M. M. T. Rodrigo, J. Shen, N. Venkatarayalu, G. Wong, M. Yamada, & L. Chi-Un Lei (Eds.), *Proceedings of 2020 IEEE International Conference on Teaching, Assessment, and Learning for Engineering, TALE 2020* (pp. 780-785). Article 9368322 (Proceedings of 2020 IEEE International Conference on Teaching, Assessment, and Learning for Engineering, TALE 2020). Institute of Electrical and Electronics Engineers Inc. https://doi.org/10.1109/TALE48869.2020.9368322

Gordillo, A., López-Fernández, D., & Verbert, K. (2020). Examining the usefulness of quality scores for generating learning object recommendations in repositories of open educational resources. *Applied Sciences*, *10*(13), 4638. MDPI AG. http://dx.doi.org/10.3390/app10134638

Guevara-Pezoa, F. (2023). Open science and its relationship with innovation: a bibliometric review. *Library Research: Archiving, Library Science and Information*, *37*(96), 109–128. https://doi.org/10.22201/iibi.24488321xe.2023.96.58778

Guzmán-Arias, L.C., Solís-Céspedes, J., & Francesa-Alfaro, A. (2019). Exploring mobile UX/UI for an OER repository search engine integrated to an LMS. In: *2019 XIV Latin American Conference on Learning Technologies (LACLO)*, 55-62. https://doi.org/10.1109/LACLO49268.2019.00020

Hajri, H., Bourda, Y., & Popineau, F. (2017). MORS: A system for recommending OERs in a MOOC. In M. Chang, N-S Chen, Kinshuk, D. G. Sampson, & R. Vasiu (Eds.), *IEEE 17th*

International Conference on Advanced Learning Technologies (ICALT) (pp. 50-52). https://doi.org/10.1109/ICALT.2017.89

Hajri, H., Bourda, Y., & Popineau, F. (2018). A system to recommend open educational resources during an online course. In B. McLaren, R. Reilly, S. Zvacek, & J. Uhomoibhi (Eds.), *Proceedings of the 10th International Conference on Computer Supported Education (CDSEU 2018)* Vol. 1 (pp 99-109). https://pdfs.semanticscholar.org/24d8/1a0d8874bfb075b90afff58ff4e247ddea85.pdf

Hameed, M. R. & El-Ameer, A.S. (2020). The design and implementation of open educational resource platform for IIPS. In *3rd International Conference on Engineering Technology and its Applications, IICETA 2020*. Institute of Electrical and Electronics Engineers Inc., pp.169-174. https://doi.org/10.1109/IICETA50496.2020.9318974

Hassan, Q. K., Rahaman, K. R., Sumon, K. Z., & Dewan, A. (2019). Lessons learned from the development of Open Educational Resources at post-secondary level in the field of Environmental Modelling: an exploratory study. *Education Sciences*, *9*(2), 103. MDPI AG. http://dx.doi.org/10.3390/educsci9020103

Hegarty, B. (2015). Attributes of open pedagogy: a model for using open educational resources. *Educational Technology*, 3-13. https://upload.wikimedia.org/wikipedia/commons/c/ca/

Henderson, S., & Ostashewski, N. (2018). Barriers, incentives, and benefits of the open educational resources (OER) movement: an exploration into instructor perspectives. *First Monday*, *23*(12). https://doi.org/10.5210/fm.v23i12.9172

Herrera-Cubides, J. F., Gaona-García, P. A., Montenegro-Marín, C. E., & Sánchez-Alonso, S. (2022). Improving OER descriptions to enhance their availability, reuse, and enrichment. *Education and Information Technologies, 27*(2), 1811–1839. https://doi.org/10.1007/s10639-021-10641-w.

Hilton, J., III. (2016). Open educational resources and college textbook choices: a review of research on efficacy and perceptions. *Educational Technology Research and Development*, *64*(4), 573–590. https://doi.org/10.1007/s11423-016-9434-9

Hilton, J. (2020). Open educational resources, student efficacy, and user perceptions: a synthesis of research published between 2015 and 2018. *Educational Technology Research and Development, 68*, 853–876. https://doi.org/10.1007/s11423-019-09700-4

Hollister, C.V & Patton, J. (2021). Faculty perceptions of an OER stipend program. *New Review of Academic Librarianship*, *28(4), 435-453*. https://doi.org/10.1080/13614533.2021.2000452

Hood, N. & Littlejohn, A. (2017). Knowledge typologies for professional learning: educators' (re)generation of knowledge when learning open educational practice. *Educational Technology Research and Development, 65*(6), 1583-1604. https://doi.org/10.1007/s11423-017-9536-z

Horn, E.A., Anderson, R. and Pierick, K. (2018). Open educational resources (OERs) in self-directed competency-based education *Information Discovery and Delivery*, *46*(4), 197-203. https://doi.org/10.1108/IDD-02-2018-0005

Iniesto, F., Tabuenca, B., Rodrigo, C., & Tovar, E. (2021). Challenges to achieving a more inclusive and sustainable open education. *Journal of Interactive Media in Education, 2021*(1), 28. https://doi.org/10.5334/jime.679

Islim, O. F. & Cagiltay, K. (2016). The impact of OER on instructional effectiveness: a case study. *Eurasia Journal of Mathematics, Science and Technology Education*, *12*(3), 559-567. https://doi.org/10.12973/iser.2016.2003a

Jacqmot, C.; Docq, F. and Deville, Y. (2020). A framework to understand, analyse and describe online and open education in higher education. In *Proceedings of the 12th International Conference on Computer Supported Education (CSEDU)* (Vol. 1, pp. 458–465). SciTePress. https://doi.org/10.5220/0009470704580465

Jemni, M., & Khribi, M. K. (2016). Toward empowering open and online education in the Arab world through OER and MOOCs. In *Open education: from OERs to MOOCs* (pp. 73-100). Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-662-52925-6_4

Jenkins, J. J., Sánchez, L. A., Schraedley, M. A. K., Hannans, J., Navick, N., & Young, J. (2020). Textbook broke: textbook affordability as a social justice issue. *Journal of Interactive Media in Education, 2020*(1), 3. https://doi.org/10.5334/jime.549

Jiménez-Castañeda, R., Castro-Gil, M., Jiménez-Ferrer, G., Suger-Bedorin, D., Socarras-Merida, L., Quiroga-Salomon, G., & Guzman-Quaharre, C. (2019, April). Standardization guide to develop collaborative massive open courses for engineering teaching in DIEGO Project. In *Proceedings of the IEEE Global Engineering Education Conference (EDUCON)* (pp. 847–852). IEEE. https://doi.org/10.1109/EDUCON.2019.8725069

Judith, K. & Bull, D. (2016). Assessing the potential for openness: A framework for examining course-level OER implementation in higher education. *Education Policy Analysis Archives, 24*(42). http://dx.doi.org/10.14507/epaa.24.1931

Julien, B.L., Lexis, L., Salisbury, F., Russell, K., & Loch, B. (2018). Human physiology students' perceptions of etextbooks: towards open access as an alternative to traditional textbooks. *International Journal of Innovation in Science and Mathematics Education*, *26*(7), 38-51. https://openjournals.library.sydney.edu.au/index.php/CAL/article/view/12650

Jung, I., & Hong, S. (2016). Faculty members' instructional priorities for adopting OER. *The International Review of Research in Open and Distributed Learning*, *17*(6). https://doi.org/10.19173/irrodl.v17i6.2803

Jung, I. & Lee, J. (2022). Open thinking as a learning outcome of open education: scale development and validation. *Distance Education, 43*(1), 119-138. https://doi.org/10.1080/01587919.2021.2020620

Jung, I., Sasaki, T. & Latchem, C. (2016). A framework for assessing fitness for purpose in open educational resources. *International Journal of Educational Technology in Higher Education, 13*(3). https://doi.org/10.1186/s41239-016-0002-5

Kaabi, K., Essalmi, F., Jemni, M. & Qaffas, A. A. (2020). Personalization of MOOCs for increasing the retention rate of learners. In Proceedings of the *2020 International Multi-Conference on: "Organization of Knowledge and Advanced Technologies" (OCTA)* (pp. 1-5). IEEE https:// doi.org/10.1109/OCTA49274.2020.9151847

Karipi, E., Mawela, A. S., & Van-Wyk, M. M. (2022). Exploring faculty members' views on the use of open education resources: A case of the Namibian open distance learning institutions. *International Journal of Educational Methodology*, *8*(1), 107-116. https://doi.org/10.12973/ijem.8.1.107

Karunanayaka, S.P., Rajendra, J.C.N., Ratnayake, H.U.W. and Naidu, S. (2016), Peer-facilitated discussions to enhance OER-based e-learning. *Asian Association of Open Universities Journal*, *11* (1), 90-104. https://doi.org/10.1108/AAOUJ-07-2016-0022

Katz, S. (2019). Leveraging library expertise in support of institutional goals: a case study of an open educational resources initiative. *New Review of Academic Librarianship*, *25*(2-4), 381-391. https://doi.org/10.1080/13614533.2019.1630655

Kaur, A., Gulati, S., Sharma, R., Sinhababu, A. & Chakravarty, R. (2022). Visual citation navigation of open education resources using Litmaps. *Library Hi Tech News*, *39*(5), 7-11. https://doi.org/10.1108/LHTN-01-2022-0012

Kimball, R., Halling, D., Neville, B. & Herbert, B. (2022). Motivations and barriers in the adoption of OERs: The role of subject librarians. *Journal of Academic Librarianship, 48*(4), https://doi.org/10.1016/j.acalib.2022.102542

King, M., Pegrum, M., & Forsey, M. (2018). MOOCs and OER in the Global South: problems and potential. *The International Review of Research in Open and Distributed Learning*, *19*(5). https://doi.org/10.19173/irrodl.v19i5.3742

Kinyua, A.H. (2021). When the trainer is untrained: stakeholder incapacitation in implementation and utilisation of open educational resources in Kenya. *Journal of Learning for Development*, *8*(1), 171-181. https://doi.org/10.56059/jl4d.v8i1.396

Kılıçkaya, F. & Kic-Drgas, J. (2021). Issues of context and design in OER (open educational resources). *Educational Technology Research and Development*, *69*(1), 401-405. https://doi.org/10.1007/s11423-020-09852-8

Kohout-Tailor, J., & Sheaffer, K. E. (2020). Using open educational resources to empower student creators. *Journal of Electronic Resources Librarianship*, *32*(1), 11-18. https://doi.org/10.1080/1941126X.2020.1709728

Kopp, M., Gröblinger, O., Zimmermann, C. (2017). Increasing educational value: The transformation of MOOCs into open educational resources. In Delgado Kloos, C., Jermann, P., Pérez-Sanagustín, M., Seaton, D., White, S. (Eds.), *Digital Education: Out to the World and Back to the Campus. EMOOCs 2017Lecture Notes in Computer Science* (Vol. 10254, pp. 223–232). Springer. https://doi.org/10.1007/978-3-319-59044-8_27

Kosmas, P., Parmaxi, A., Perifanou, M. & Economides, A. A. (2021). Open educational resources for language education: towards the development of an e-Toolkit. In: Zaphiris, P., Ioannou, A. (eds) *Learning and Collaboration Technologies: New Challenges and Learning Experiences. HCII 2021.* Lecture Notes in Computer Science, vol 12784. Springer, Cham. https://doi.org/10.1007/978-3-030-77889-7_5

Kruger, J. S. & Hollister, C. (2021). Engaging undergraduate public health students through a textbook creation project. *Pedagogy in Health Promotion*, 7(3), 226–234. https://doi.org/10.1177/2373379920962416

Kumar, A. & Singh, M. (2019). Exploring the use and practice of open educational resources (OERs) in social science discipline with special reference to University of Delhi, Delhi. *Library Philosophy and Practice (e-Journal)*, 1–21 https://digitalcommons.unl.edu/libphilprac/2664/

Kumar, A., Baishya, D. & Deka, M. (2021). Open educational resources (OER) issues and problems experienced by social scientists of select higher educational institutions in India. *Library Philosophy and Practice (e-journal)*, 5625: 1-20 https://digitalcommons.unl.edu/libphilprac/5625

Kwak, S. (2017). How Korean language arts teachers adopt and adapt open educational resources: a study of teachers' and students' perspectives. *The International Review of Research in Open and Distributed Learning*, *18*(4). https://doi.org/10.19173/irrodl.v18i4.2977

Lane, A. (2010). Designing for innovation around OER. *Journal of Interactive Media in Education*, *2010*(1), Art 2. https://doi.org/10.5334/2010-2

Lima-Lopes, R. E. de, & Biazi, T. M. D. (2021). Digital resources and English as an additional language in higher education: possibilities for internationalization. *Ilha Do Desterro 74*(3). https://doi.org/10.5007/2175-8026.2021.e79735

Lin, H. (2019). Teaching and learning without a textbook: undergraduate student perceptions of open educational resources. *The International Review of Research in Open and Distributed Learning*, *20*(3). https://doi.org/10.19173/irrodl.v20i4.4224

Liu, J. C., & Johnson, E. (2020). Instructional development of media-based science OER. *TechTrends*, *64*(3), 439-450. https://doi.org/10.1007/s11528-020-00481-9

Luo, T., Hostetler, K., Freeman, C., & Stefaniak, J. (2020). The power of open: benefits, barriers, and strategies for integration of open educational resources. *Open Learning, 35*(2), 140-158. https://doi.org/10.1080/02680513.2019.1677222

MacKinnon, T. & Pasfield-Neofitou, S. (2016). OER "produsage" as a model to support language teaching and learning. *Education Policy Analysis Archives*, *24*(40). http://dx.doi.org/10.14507/epaa.24.1825

Maharaj, N. G., Upadhyay, A. U. & Trivadi, M. J. (2021). SWOT Analysis of the role of open educational resources in future education with special reference to open university library and librarian. *Library Philosophy and Practice (e-journal)*, 6197. https://digitalcommons.unl.edu/libphilprac/6197/

Marín, V.I., Zawacki-Richter, O., Aydin, C.H., Bedenlier, S., Bond, M., Bozkurt, A., Conrad, D., Jung, I., Kondakci, Y., Prinsloo, P., Roberts, J., Veletsianos, G., Xiao, J & Zhang, J. (2022). Faculty perceptions, awareness and use of open educational resources for teaching and learning in higher education: a cross-comparative analysis. *Research and Practice in Technology Enhanced Learning 17*(11). https://doi.org/10.1186/s41039-022-00185-z

Marjit, U. & Kumar, P. (2020). Towards a decentralized and distributed framework for open educational resources based on IPFS and blockchain. In *Proceedings of the 2020 International Conference on Computer Science Engineering and Applications (ICCSEA) (pp.1-6). IEEE*. https://doi.org/ 10.1109/ICCSEA49143.2020.9132841

Markin, P. B. (2021). Open educational resources in the context of open access. In *University Library at a New Stage of Social Communications Development. Conference Proceedings*, (6), 76–82. https://doi.org/10.15802/unilib/2021_249625

Masterman, E. (2016). Bringing open educational practice to a research-intensive university: prospects and challenges. *Electronic Journal of e-Learning*, *14*(1), 31–42. https://ora.ox.ac.uk/objects/uuid:19c7575d-916f-48a5-9474-050bf92b02bc

Mays, T. (2020). Open educational resources in South Africa. In: Huang, R., Liu, D., Tlili, A., Gao, Y., Koper, R. (eds) Current State of Open Educational Resources in the "Belt and Road" Countries. *Lecture Notes in Educational Technology*. Springer, Singapore. https://doi.org/10.1007/978-981-15-3040-1_11

Mays, T. J., Ogange, B., Naidu, S., & Perris, K. (2021). Supporting teachers moving online, using a MOOC, during the COVID-19 pandemic. *Journal of Learning for Development*, *8*(1), 27–41. https://doi.org/10.56059/jl4d.v8i1.497

Mazohl, P., Ossiannilsson, E. & Makl, H. (2018). Technical innovation in blended learning – concepts for the creation of high quality continuous vocational education courses using multiple devices. *In Proceedings of the 10th International Conference on Computer Supported Education (CSEDU 2018)* (pp. 548–554). SciTePress. https://doi.org/10.5220/0006817405480554

Mazzucato, A. and Kic-Drgas, J. (2021). Develop OERs for technology enhanced learning. In P. Limone & R. Di Fuccio (Eds.), *Proceedings of the Second Workshop on Technology Enhanced Learning Environments for Blended Education – The Italian E-Learning Conference 2021* (Vol. 3025, pp. 89–98). CEUR-WS.org. http://ceur-ws.org/Vol-3025/paper9.pdf

McFaul, H., & FitzGerald, E. (2021). Supporting access to justice through volunteer training: an evaluation of an open educational resource. *Journal of Interactive Media in Education, 2021*(1) https://doi.org/10.5334/jime.630

McGreal, R. (2020). Open educational resources in Canada 2020. *Canadian Journal of Learning and Technology*, *46*(1). University of Alberta Libraries. https://doi.org/10.21432/cjlt27935

McGreal, R., Mackintosh, W., Cox, G., & Olcott, Jr., D. (2022). Bridging the gap: micro-credentials for development. *The International Review of Research in Open and Distributed Learning* 23(3), 288–302. https://doi.org/10.19173/irrodl.v23i3.6696

Mengual-Andrés, S. & Payá-Rico, A. (2018). Open educational resources' impact and outcomes: the essence of OpenKnowledge and its social contribution. *Education Policy Analysis Archives*, *26*, 119. https://doi.org/10.14507/epaa.26.3667

Mishra, M., Dash, M. K., Sudarsan, D., Santos, C. A..G., Mishra, S. K., Kar, D., Bhat, I. A., Panda, B. K., Sethy, M. & Silva, R. M. D. (2022). Assessment of trend and current pattern of open educational resources: a bibliometric analysis. *Journal of Academic Librarianship*, *48*(3) https://doi.org/10.1016/j.acalib.2022.102520

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & Prisma Group. (2010). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *International Journal of Surgery*, *8*(5), 336-341. https://doi.org/10.1016/j.ijsu.2010.02.007

Morales, R., & Baker, A. (2018). Secondary students' perceptions of open science textbooks. *Journal of Interactive Media in Education*, *2018*(1), https://doi.org/10.5334/jime.455

Moreno, N., Caro, E., & Cabedo, R. (2018). Systematic review: OER and disability. In M. El Mohajir, M. Al Achhab, B. El Mohajir, & I. Jellouli (Eds.), *2018 IEEE 5th International Congress on Information Science and Technology (CiSt)* (pp. 428–431). IEEE. https://doi.org/10.1109/CIST.2018.8596659

Mosharraf, M, & Taghiyareh, F. (2016). Federated search engine for open educational linked data. *Bulletin of the Technical Committee on Learning Technology*, *18*(4), 6-9. https://tc.computer.org/tclt/wp-content/uploads/sites/5/2017/04/Mosharraf.pdf

Mosharraf, M, & Taghiyareh, F. (2020). Automatic syllabus-oriented remixing of open educational resources using agent-based modeling. *IEEE Transactions on Learning Technologies*, *13*(2), 297-311. https://doi.org/10.1109/TLT.2019.2937084

Muganda, C. K., Samzugi, A. S., & Mallinson, B. J. (2016). Analytical insights on the position, challenges, and potential for promoting OER in ODeL Institutions in Africa. *The International Review of Research in Open and Distributed Learning*, *17*(4). https://doi.org/10.19173/irrodl.v17i4.2465

Nagashima, T. & Hrach, S. (2021). Motivating factors among university faculty for adopting open educational resources: incentives matter. *Journal of Interactive Media in Education, 2021*(1). https://doi.org/10.5334/jime.678

Navarrete R. & Luján-Mora S. (2016). OER-based lifelong learning for older people. *In Proceedings of the 8th International Conference on Computer Supported Education (CSEDU 2016)* (Vol. 2, pp. 388–393). SciTePress. https://doi.org/10.5220/0005792503880393

Navarrete, R. & Martinez-Mosquera, D. (2020). Overcoming barriers for OER adoption in higher education application to computer science curricula. *n Proceedings of the 12th International Conference on Computer Supported Education (CSEDU 2020)* (Vol. 1, pp. 559–566). SciTePress. https://doi.org/10.5220/0009471205590566

Ng, R.-Y., Ng, K.-K. & Liu, B. (2019). An empirical study on the usefulness, effectiveness and practicability of vocational and professional education and training's (VPET) open educational resources (OER) in the hotel industry. In K. S. Cheung, L. Kwok, K. Kubota, L. Ma, & W. W. Ng (Eds.), *Blended learning: Educational innovation for personalized learning. 12th International Conference, ICBL 2019, Hradec Kralove, Czech Republic, July 24, 2019, Proceedings* (Vol. 11546, pp. 265–276). Springer. https://doi.org/10.1007/978-3-030-21562-0_22

Nkuyubwatsi, B. (2018). Revisiting the reusability and openness of resources in the Massachusetts Institute of Technology Open Courseware. *Journal of Interactive Media in Education*, *2018*(1), Art. 3. https://doi.org/10.5334/jime.447

Nurhas, I., Pawlowski, J.M., Jansen, M., Stoffregen, J. (2016). OERauthors: requirements for collaborative OER authoring tools in global settings. In K. Verbert, M. Sharples, & T. Klobučar (Eds.), *Adaptive and adaptable learning: Proceedings of the 11th European Conference on Technology Enhanced Learning (EC-TEL 2016)* (Vol. 9891, pp. 460–465). Springer. https://doi.org/10.1007/978-3-319-45153-4_43

Oelfke, A. L., Sadowski, J. A., Mathwig Ramseier, C., Iremonger, C., Volkert, K., Dykman, E., Kuhl, L. & Baumann, A. (2021). Using open educational resources at Viterbo University: faculty and student feedback. *The International Review of Research in Open and Distributed Learning, 22*(1), 78–90. https://doi.org/10.19173/irrodl.v22i1.4970

Olivier, J. A. K. (2018). The state of online open educational resources in Afrikaans: Afrikaans teaching as a case study. *Tydskrif vir Geesteswetenskappe*, *58*(4-2), 905-924. https://doi.org/10.17159/2224-7912/2018/v58n4-2a3

Orr, D., Weller, M. and Farrow, R. (2019). How is digitalisation affecting the flexibility and openness of higher education provision? Results of a global survey using a new conceptual model. *Journal of Interactive Media in Education*, *2019*(1). http://doi.org/10.5334/jime.523

Otto, D. (2019). Adoption and diffusion of open educational resources (OER) in education: a meta-analysis of 25 OER-projects. *The International Review of Research in Open and Distributed Learning*, *20*(5), 122–140. https://doi.org/10.19173/irrodl.v20i5.4472

Otto, D., Schroeder, N., Diekmann, D., & Sander, P. (2021). Trends and gaps in empirical research on open educational resources (OER): a systematic mapping of the literature from 2015 to 2019. *Contemporary Educational Technology, 13*(4), ep325. https://doi.org/10.30935/cedtech/11145

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., McGuinness, L. A., Stewart, L. A., Thomas, J., Tricco, A. C., Welch, V. A., Whiting, P. & Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *British Medical Journal, 372*(71). https://doi.org/10.1136/bmj.n71

Pande, J. (2018). Opportunities and challenges in the adoption of open educational resources for course development: a case study of Uttarakhand Open University. *International Journal of Information Technology*, *10*(3). http://dx.doi.org/10.1007/s41870-018-0126-z

Pande J. (2019). Open educational practices at Uttarakhand Open University: from policies to implementation. *International Journal of Information Technology* (Singapore), *11*(3), 445-452. https://doi.org/10.1007/s41870-018-0208-y

Pande, J., Singh, A., Intaratat, K. & Mythali, G. (2019). Sharing, adaptation and organization of open educational resources: exploring the teachers' attitude of Sukhothai Thamathirat Open University, Thailand. *International Journal of Engineering and Advanced Technology*, *9*(1). http://dx.doi.org/10.35940/ijeat.A1016.109119

Perez, J. E. (2017). Images and the open educational resources (OER) Movement. *Reference Librarian, 58*(4), 229-237. https://doi.org/10.1080/02763877.2017.1346495

Pérez-Paredes, Pascual & Ordoñana Guillamón, Carlos & Aguado, Pilar. (2018). Language teachers' perceptions on the use of OER language processing technologies in MALL. *Computer Assisted Language Learning*, *31*(5-6), 522-545. http://dx.doi.org/10.17863/CAM.21321

Perifanou, M. & Economides, A.A. (2022a). Discoverability of OER: the case of language OER. n M. Divitini, M. Heričko, & A. P. Rocha (Eds.), *Ludic, co-design and tools supporting smart learning ecosystems and smart education* (pp. 55–66). Springer. https://doi.org/10.1007/978-981-16-3930-2_5

Perifanou, M. & Economides, A.A. (2022b). Measuring quality, popularity, demand and usage of repositories of open educational resources (ROER): a study on thirteen popular ROER. *Open Learning: The Journal of Open, Distance and e-Learning 37*(3), 251–267. https://doi.org/10.1080/02680513.2022. 2033114

Petrich, M. (2020). Building an OER program based on stakeholder feedback. *Reference Services Review*, *48*(3), 489-501. https://doi.org/10.1108/RSR-03-2020-0013

Petrides, L., Goger, L., & Jimes, C. (2016). The role of "open" in strategic library planning. *Education Policy Analysis Archives*, *24*(38), 1–19. https://doi.org/10.14507/epaa.24.2478

Petrucco, C. & Ferranti, C. (2020). Wikipedia as OER: the "Learning with Wikipedia" project. *Journal of e-Learning and Knowledge Society, 16*(4), 38–45. https://doi.org/10.20368/1971-8829/1135322

Piedra, N., Chicaiza, J., Atenas, J., Lopez-Vargas, J., Tovar, E. (2016). Using linked data to blended educational materials with OER—a general context of synergy: linked data for describe, discovery and retrieve OER and human beings knowledge to provide context. In P. J. Muñoz-Merino, J. A. Ruipérez-Valiente, & C. Alario-Hoyos (Eds.), *Open education: From OERs to MOOCs* (pp. 283–313). Springer. https://doi.org/10.1007/978-3-662-52925-6_15

Pitt, R., Jordan, K., de los Arcos, B., Farrow, R. & Weller, M. (2020) Supporting open educational practices through open textbooks. *Distance Education*, *41*(2), 303-318. https://doi.org/10.1080/01587919.2020.1757411

Ponte, F., Lennox, A., & Hurley, J. (2021). The evolution of the open textbook initiative. *Journal of the Australian Library and Information Association*, *70*(2), 194–212. https://doi.org/10.1080/24750158.2021.1883819

Pounds, A. & Bostock, J. (2019). Open educational resources (OER) in higher education courses in aquaculture and fisheries: opportunities, barriers, and future perspectives. *Aquaculture International* 27, 695–710. https://doi.org/10.1007/s10499-019-00355-9

PRISMA (2020). Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA). https://www.prisma-statement.org/

Pulker, H. & Kukulska-Hulme, A. (2020). Openness reexamined: teachers' practices with open educational resources in online language teaching. *Distance Education*, *41*(2), 216-229. https://doi.org/10.1080/01587919.2020.1757412

Ramirez-Montoya, M. S. (2020). MOOCs and OER: developments and contributions for open education and open science. In D. Burgos (Ed.), *Radical solutions and open science: An open approach to boost higher education* (pp. 159–175). Springer. https://doi.org/10.1007/978-981-15-4276-3_10

Reid, P., & Maybee, C. (2021). Textbooks and Course Materials: A Holistic 5-Step Selection Process. *College Teaching*, *70*(4), 518–529. https://doi.org/10.1080/87567555.2021.1987182

Ren, X. (2019). The undefined figure: instructional designers in the open educational resource (OER) movement in higher education. *Education and Information Technologies*, *24*(6), 3483-3500. https://doi.org/10.1007/s10639-019-09940-0

Rethlefsen, M. L., & Page, M. J. (2022). PRISMA 2020 and PRISMA-S: common questions on tracking records and the flow diagram. *Journal of the Medical Library Association, 110*(2), 253–257. https://doi.org/10.5195/jmla.2022.1449

Risquez, A., McAvinia, C., Desmond, Y., Bruen, C., Ryan, D., & Coughlan, A. (2020). Towards a devolved model of management of OER? The case of the Irish higher education sector. *The International Review of Research in Open and Distributed Learning*, *21*(1), 100–112. https://doi.org/10.19173/irrodl.v20i5.4545

Ritella, G., Montanari, M., Spila, A., Lariccia, S. & Cesareni, D. (2017). Using OERs at the border between formal education and professional development. In *Proceedings of the 9th International Conference on Computer Supported Education (CSEDU 2017)* (Vol. 1, pp. 525–530). Porto, Portugal. https://hdl.handle.net/11573/1640392

Rivera, S. M. & Chotto, M.C. (2017). Contributing to the OER movement: A practical experience: The case of the Informatics School, UNA. *2017 XLIII Latin American Computer Conference (CLEI)*, 1-11. https://doi.org/10.1109/clei.2017.8226427

Rocha, J., Pessoa, P., Gomes, J.A., Sá-Pinto, X., Lopes, B. (2021). BiblioLab Project: teachers, parents and students' perspectives about the usability and usefulness of an educational distance learning platform. In M. A. Baptista Nunes, M. McPherson, & P. Isaías (Eds.), *Technology and innovation in learning, teaching and education: Proceedings of the International Conference on Technology and Innovation in Learning, Teaching and Education (TECH-EDU 2020)* (pp. 90–110). Springer. https://doi.org/10.1007/978-3-030-73988-1_7

Rolfe, V. (2017). Striving toward openness: but what do we really mean?. *The International Review of Research in Open and Distributed Learning*, *18*(7), 141-160. https://doi.org/10.19173/irrodl.v18i7.3207

Romero Peláez, A. E. & Morocho Yunga, J. C. (2016). Características inherentes para OER's accesibles. *Opción*, *32*(2). https://produccioncientificaluz.org/index.php/ opcion/article/view 21559

Saay, S. & Margaria, T . (2020). Model-Driven-Design of NREn Bridging Application: Case Study AfgREN. *2020 IEEE 44th Annual Computers, Software, and Applications Conference (COMPSAC)*, 1522–1527. https://doi.org/10.1109/COMPSAC48688.2020.00-39

Sánchez González, M., Miró Amarante, M. L., Ruiz Rey, F. J. and Cebrián de la Serna, M. (2022). Evaluation of online teacher training programs on innovation and digital skills during Covid-19: #webinarsUNIA. *RIED-Revista Iberoamericana de Educación a Distancia (The Ibero-American Journal of Digital Education)*, *25*(1), 121-140. https://hdl.handle.net/11162/233087

Sandanayake, T. C. (2019). Promoting open educational resources-based blended learning. *International Journal of Educational Technology in Higher Education*, *16*(1), 3. https://doi.org/10.1186/s41239-019-0133-6

Santiago, A. and Ray, L. (2020). Navigating support models for OER publishing: case studies from the University of Houston and the University of Washington. *Reference Services Review*, *48*(3), pp. 397-413. https://doi.org/10.1108/RSR-03-2020-0019

Santos-Hermosa, G., Estupinyà, E., Nonó-Rius, B., París-Folch, L., & Prats-Prat, J. (2020). Open educational resources (OER) in the Spanish universities. *Profesional de La Informacion, 29*(6), 1–19. https://doi.org/10.3145/epi.2020.nov.37

Santos-Hermosa, G., Ferran-Ferrer, N., & Abadal, E. (2017). Repositories of open educational resources: an assessment of reuse and educational aspects. *The International Review of Research in Open and Distributed Learning*, *18*(5), 1-21. https://doi.org/10.19173/irrodl.v18i5.3063

Schön, S., Ebner, M., & Hornung-Prähauser, V. (2017). Digital social innovation within education: Five insights on the role of digital tools in the field of open educational resources (OER) projects. In R. V. Nata (Ed.), *Progress in Education* (Vol. 49, pp. 167-188). Nova Science Publishers.

Schuwer, R., & Janssen, B. (2018). Adoption of sharing and reuse of open resources by educators in higher education institutions in the Netherlands: A qualitative research of practices, motives, and conditions. *The International Review of Research in Open and Distributed Learning, 19*(3), 1-20. https://doi.org/10.19173/irrodl.v19i3.3390

Senn, L. G., Heim, A. B., Vinson, E., & Smith, M. K. (2022). How do undergraduate biology instructors engage with the open educational resource life cycle? *Frontiers in Education, 7*, 835764. https://doi.org/10.3389/feduc.2022.835764

Seraphin, S. B., Grizzell, J. A., Kerr-German, A., Perkins, M. A., Grzanka, P. R., & Hardin, E. E. (2019). A conceptual framework for non-disposable assignments: inspiring implementation, innovation, and research. *Psychology Learning & Teaching*, *18*(1), 84–97. https://doi.org/10.1177/1475725718811711

Shemy, N. & Al-Habsi, M . (2021). The effect of a training program based on open educational resources on the teachers online professional development and their attitudes towards it of AL-Dakhliya governorate in sultanate of Oman. *Journal of E-Learning and Knowledge Society, 17*(1), 18-28. https://doi.org/10.20368/1971-8829/1135283

Sheu, F.-R., & Shih, M. (2017). Evaluating NTU's OpenCourseWare project with Google analytics: user characteristics, course preferences, and usage patterns. *The International Review of Research in Open and Distributed Learning*, *18*(4). https://doi.org/10.19173/irrodl.v18i4.3025

Singh, M., Adebayo, S. O., Saini, M. & Singh, J. (2021). Indian government e-learning initiatives in response to COVID-19 crisis: A case study on online learning in Indian higher education system. *Education and Information Technologies*, *26*, 7569–7607. https://doi.org/10.1007/s10639-021-10585-1

Smirani, L. & Boulahia, J. (2022). Using the Unified Theory of Acceptance and Use of Technology to investigate the adoption of open educational resources by faculty members. *International Journal of Information Technology*, *14*, 3201–3211. https://doi.org/10.1007/s41870-022-00918-9

Smith, B. & Lee, L. (2017). Librarians and OER: cultivating a community of practice to be more effective advocates. *Journal of Library and Information Services in Distance Learning* 11(1/2):106–122. https://doi.org/10.1080/1533290X.2016.1226592

Smith, M.S. and Casserly, C.M. (2006) The promise of open educational resources. *Change: The Magazine of Higher Learning*, *38*, 8-17. https://www.oerafrica.org/resource/promise-open-educational-resources

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, *104*(November), 333-339. https://doi.org/10.1016/j.jbusres.2019.07.039

Stanberry, K. (2022). OER textbooks: A helpful tool for DEI initiatives in higher education. *Journal of Higher Education Theory and Practice*, *22*(8), 33-36. https://doi.org/10.33423/jhetp.v22i8.5313

Stefanović, N. & Milošević, D. (2016). Innovative OER model for technology enhanced academic and entrepreneurial learning. In M. Jemni, Kinshuk, & M. K. Khribi (Eds.), *Open education: From OERs to MOOCs* (pp. 343–360). Springer. https://doi.org/10.1007/978-3-662-52925-6_17

Stoffregen, J. D., Pawlowski, J. M., Ras, E., Tobias, E., Šćepanović, S., Fitzpatrick, D., Mehigan, T., Steffens, P., Przygoda, C., Schilling, P., Friedrich, H. & Moebs, S. (2016). Barriers to open e-learning in public administrations: a comparative case study of the European countries Luxembourg, Germany, Montenegro and Ireland. *Technological Forecasting and Social Change*, *111*, 198-208. http://dx.doi.org/10.1016/j.techfore.2016.06.030

Sunar, A. S., Novak, E. & Mladenić, D. (2020). Users' learning pathways on cross-site open educational resources. In *Proceedings of the 12th International Conference on Computer Supported Education (CSEDU 2020)* (Vol. 2, pp. 84–95). SciTePress. https://doi.org/10.5220/0009391600840095

Sungkur, R. K. & Santally, M. I. (2019). Knowledge sharing for capacity building in open and distance learning (ODL): Reflections from the African experience. *Journal of the Knowledge Economy, 10*, 380–396. https://doi.org/10.1007/s13132-017-0459-z

Sutton, A., Clowes, M., Preston, L., & Booth, A. (2019). Meeting the review family: Exploring review types and associated information retrieval requirements. *Health Information & Libraries Journal*, 36(3), 202–222. https://doi.org/10.1111/hir.12276

Sweet, C. & Clarage, E. C. (2020). Library consortia contributing to college affordability: collection and OER initiatives in the Consortium of Academic and Research Libraries in Illinois. *Reference Services Review*, *48*(3), 433-445. https://doi.org/10.1108/RSR-03-2020-0014

Tammaro, A.M., Ciancio, L., De Rosa, R., Pantò, E., Nascimbeni, F. (2017). Digital libraries in open education: the Italy case. In M. Agosti, J. Manolopoulos, S. Kapidakis, C. Papatheodorou, & G. Tsakonas (Eds.), *Digital libraries and archives: 13th Italian research conference on digital libraries, IRCDL 2017, Modena, Italy, January 26–27, 2017, revised selected papers* (pp. 32–41). Springer. https://doi.org/10.1007/978-3-319-68130-6_3

Tang, H. & Bao, Y . (2021). Latent class analysis of K-12 teachers' barriers to implementing OER. *Distance Education*, *42*(4), 582-598. https://doi.org/10.1080/01587919.2021.1986371

Thanuskodi, S. (Ed.). (2020). *Challenges and Opportunities of Open Educational Resources Management*. IGI Global. https://doi.org/10.4018/978-1-7998-3559-2

Thomas, W. J. & Bernhardt, B. R. (2018). Helping keep the costs of textbooks for students down: two approaches. *Technical Services Quarterly*, *35*(3), 257-268. https://doi.org/10.1080/07317131.2018.1456844

Tietjen, P. & Asino, T. I. (2021). What is open pedagogy? identifying commonalities. *The International Review of Research in Open and Distributed Learning*, *22*(2), 185–204. https://doi.org/10.19173/irrodl.v22i2.5161

Tillinghast, B., Fialkowski, M. K. & Draper, J. (2020). Exploring aspects of open educational resources through OER-enabled pedagogy. *Frontiers in Education*, *5*, 76. https://doi.org/10.3389/feduc.2020.00076

Tillinghast, B. (2020). Developing an open educational resource and exploring OER-enabled pedagogy in higher education. *IAFOR Journal of Education: Technology in Education*, *8*(2). https://doi.org/10.22492/ije.8.2.09

Tisoglu, S., Kursun, E., & Cagiltay, K. (2020). Open educational resources in Turkey. In M. Jemni, Kinshuk, & M. K. Khribi (Eds.), *Current state of open educational resources in the "Belt and Road" countries* (pp. 213–232). Springer. https://doi.org/10.1007/978-981-15-3040-1_12

Tlili, A., Huang, R., Chang, T.-W., Nascimbeni, F., & Burgos, D. (2019). Open educational resources and practices in China: a systematic literature review. *Sustainability*, 11(8), 4867. https://doi.org/10.3390/su11184867

Tlili, A., Jemni, M., Khribi, M.K, Huang, R., Chang, T. W. & Liu, D. (2020). Current state of open educational resources in the Arab region: an investigation in 22 countries. *Smart Learning Environments*, 7, 11. https://doi.org/10.1186/s40561-020-00120-z

Tlili, A., Zhang, J., Papamitsiou, Z., Manske, S., Huang, R. K. & Hoppe, H. U. (2021). Towards utilising emerging technologies to address the challenges of using open educational resources: a vision of the future. *Educational Technology Research and Development*, *69*, 515–532. https://doi.org/10.1007/s11423-021-09993-4

Tlili, A., Altinay, F., Huang, R., Altinay, Z., Olivier, J., Mishra, S., Jemni, M., & Burgos, D. (2022). Are we there yet? a systematic literature review of open educational resources in Africa: A combined content and bibliometric analysis. *PLOS ONE*, *17*(1). https://doi.org/10.1371/journal.pone.0262615

Todorinova, L., & Wilkinson, Z. T. (2020). Incentivizing faculty for open educational resources (OER) adoption and open textbook authoring. *Journal of academic librarianship*, *46*(6), 102220. https://doi.org/10.1016/j.acalib.2020.102220

Torraco, R. J. (2005). Writing integrative literature reviews: guidelines and examples. *Human Resource Development Review*, *4*(3), 251-367. https://doi.org/10.1177/1534484305278283

Towey, D., Foster, D., Gilardi, F., Martin, P., White, A. Jiang, Y., Pan, Y. & Qu, Y. (2017). Developing an open educational resource: reflections on a student-staff collaboration. In *2017 IEEE 41st Annual Computer Software and Applications Conference (COMPSAC)* (Vol. 2, pp. 707–711). IEEE. https://doi.org/10.1109/COMPSAC.2017.281

Towey, D. & Zhao, K. (2017). Developing an automated coding tutorial OER. In *2017 IEEE 6th International Conference on Teaching, Assessment, and Learning for Engineering (TALE)* (pp. 233–238). IEEE. https://doi.org/10.1109/TALE.2017.8252339

Truong, V., Denison, T. & Stracke, C. M. (2021). Developing institutional open educational resource repositories in Vietnam: opportunities and challenges. *The International Review of Research in Open and Distributed Learning*, *22*(4), 109–124. https://doi.org/10.19173/irrodl.v23i1.5582

Venegas Muggli, J. I., & Westermann, W. (2019). Effectiveness of OER use in first-year higher education students' mathematical course performance: a case study. *The International Review of Research in Open and Distributed Learning*, *20*(2), 176-194. https://doi.org/10.19173/irrodl.v20i2.3521

Villar-Onrubia, D. (2022). "They have to combine the future of the university and their own future": OpenWourseware (OCW) authoring as an academic practice in Spain. *The International Review of Research in Open and Distributed Learning*, *23*(2), 63–85. https://doi.org/10.19173/irrodl.v23i2.5765

Vogus, B. (2019). Open educational resources (OER) and textbooks: opportunities for academic libraries. *Public Services Quarterly*, 15(3), 242-247. https://doi.org/10.1080/15228959.2019.1629858

Vollman, B. K. (2021). Access, use and perceptions of open (free) and traditional textbooks: an exploratory comparative analysis of community college criminal justice courses. *Open Learning: The Journal of Open, Distance and e-Learning*, *38*(3), 260-280. https://doi.org/10.1080/02680513.2021.1874330

Voß, F., De Fries, T., Möbs, S., Pawlowski, J.M., Raffl, C., Stoffregen, J. (2018). A competence framework for open educational resources: the case of the public sector. In M. L. Bote-Lorenzo, J. I. Asensio-Pérez, & R. C. Martínez-Monés (Eds.), *Learning technology for education challenges* (pp. 80–92). Springer. https://doi.org/10.1007/978-3-319-95522-3_8

Wang, S. & Wang, H. (2017). Adoption of open educational resources (OER) textbook for an introductory information systems course. *Open Learning: The Journal of Open, Distance and e-Learning*, *32*(3), 224-235. https://doi.org/10.1080/02680513.2017.1354762

Weller, M., de los Arcos, B., Farrow, R., Pitt, B., & McAndrew, P. (2015). The impact of OER on teaching and learning practice. *Open Praxis*, 7(4), 351-361. https://search.informit.org/doi/10.3316/informit.663878263374139

Werth, E. & Williams, K. (2021a). Learning to be open: instructor growth through open pedagogy, *Open Learning: The Journal of Open, Distance and e-Learning. 36*(3), *251-265.* https://doi.org/10.1080/02680513.2021.1970520

Werth, E., & Williams, K. (2021b). What motivates students about open pedagogy? Motivational regulation through the lens of self-determination theory. *The International Review of Research in Open and Distributed Learning*, *22*(3), 34–54. https://doi.org/10.19173/irrodl.v22i3.5373

Wiche, H. I. & Ogunbodede, K. F. (2021). Awareness and use of open educational resources by library and information science students of Ignatius Ajuru University of Education, Rivers State, Nigeria *Library Philosophy and Practice (e-journal)*. 5373. https://digitalcommons.unl.edu/libphilprac/5373

Wijayati, P. H., Kharis, M., Hidayat, E., Ardiyani, D. K., Ebner, M., & Schön, S. (2022). Teaching German as a foreign language with open educational resources (OER): implementation in and experiences from an Indonesian university. *International Journal of Emerging Technologies in Learning*, *17*(4), 225–238. https://doi.org/10.3991/ijet.v17i04.23225

Wiley, D., Bliss, T.J., McEwen, M. (2014). Open educational resources: a review of the literature. In: Spector, J., Merrill, M., Elen, J., Bishop, M. (Eds.) *Handbook of Research on Educational Communications and Technology*. Springer, New York, NY. https://doi.org/10.1007/978-1-4614-3185-5_63

Wiley, D., & Gurrell, S. (2009). A decade of development…. *Open Learning: The Journal of Open, Distance and e-Learning*, *24*(1), 11–21. https://doi.org/10.1080/02680510802627746

Wiley, D., Williams, L., DeMarte, D., & Hilton, J. (2016). The Tidewater Z-Degree and the INTRO model for sustaining OER adoption. *Education Policy Analysis Archives*, *24*, 41. https://doi.org/10.14507/epaa.24.1828

Wolfenden, F., & Adinolfi, L. (2019). An exploration of agency in the localisation of open educational resources for teacher development. *Learning, Media and Technology*, *44*(3), 327–344. https://doi.org/10.1080/17439884.2019.1628046.

Wong, B. T. M., & Li, K. C. (2019). Using open educational resources for teaching in higher education: a review of case studies. In *Proceedings - 2019 International Symposium on Educational Technology, ISET 2019* (186–190). IEEE. https://doi.org/10.1109/ISET.2019.00046

Wright, R., Padgett, L., Whitehead, D., & Bossu, C. (2016). Open education licensing – making online education really work. In *Proceedings of the ASCILITE 2016 Conference* (pp. 675–676). Australasian Society for Computers in Learning in Tertiary Education. https://hdl.handle.net/102.100.100/509424

Yang, J., Kinshuk (2016). Survey and reflection of open education policies. In Jemni, M., Kinshuk, Khribi, M. (Eds.) *Open Education: from OERs to MOOCs (pp. 23-37)*. Springer. https://doi.org/10.1007/978-3-662-52925-6_2

Zaatri, I., Margoum, S., Bendaoud, R., El Malti, I.L., Burgos, D., Berrada, K. (2020). Open educational resources in Morocco. In Huang, R., Liu, D., Tlili, A., Gao, Y., Koper, R. (Eds.) *Current State of Open Educational Resources in the "Belt and Road" Countries.* Springer. https://doi.org/10.1007/978-981-15-3040-1_7

Zaid, Y. A. & Alabi, A. O. (2021). Sustaining open educational resources (OER) initiatives in Nigerian Universities, *Open Learning: The Journal of Open, Distance and e-Learning*, *36*(2), 181-197. https://doi.org/10.1080/02680513.2020.1713738

Zhang, M. & Li, Y. (2017). Teaching experience on faculty members' perceptions about the attributes of open educational resources (OER). *International Journal of Emerging Technology in Learning*, *12*(4), 191-199. https://www.learntechlib.org/p/180127/.

Zhang, X. (2020). Revisiting textbook adaption through open educational resources: an inquiry into students' emotions. *International Review of Research in Open and Distributed Learning*, *21*(3), 197–210. https://doi.org/10.19173/irrodl.v21i3.4775

Zhang, X., Tlili, A., Shubeck, K., Hu, X., Huang, R., & Zhu, L. (2021). Teachers' adoption of an open and interactive e-book for teaching K-12 students Artificial Intelligence: a mixed methods inquiry. *Smart Learning Environments 8*(1). https://doi.org/10.1186/s40561-021-00176-5

Zhu, M., & Kadirova, D. (2020). Self-directed learners' perceptions and experiences of learning computer science through MIT open courseware. *Open Learning: The Journal of Open, Distance and e-Learning*, *37*(4), 370–385. https://doi.org/10.1080/02680513.2020.1781606

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Conceptualization (RF); Data curation (RF, CB, FI, RP, MW); Formal Analysis (RF, CB, FI, RP, MW); Funding (RF, MW); Investigation (RF, CB, FI, RP, MW); Methodology (RF); Project administration (RF); Resources (N/A); Software (RF); Supervision (N/A); Validation (RF, CB, FI, RP, MW); Visualization (N/A); Writing – original draft (RF); Writing – review & editing (RF, CB, FI, RP)

All authors have read and agreed to the published version of the manuscript.

DATA ACCESSIBILITY

Data supporting this study are curated at https://osf.io/m6twc/. The list of references, thematic mapping, stakeholder model and other supplementary materials used for this study can be found at DOI 10.17605/OSF.IO/M6TWC. All are licensed for reuse CC BY 4.0.

ETHICS AND CONSENT

This study collected no original data and used previously published materials, so no consent was sought.

COMPETING INTERESTS

None to declare.

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To maintain transparency and academic integrity, we follow Academic Integrity and Transparency in AI-assisted Research and Specification (aiTARAS) Framework (Bozkurt, 2023):

The results sections of this paper were edited and refined with the assistance of ChatGPT 4.0 (Version as of August 2024), complementing the human editorial process. The main purpose of using this tool was to condense existing copy written by the authors to reduce the word count. The human authors critically assessed and validated the content to maintain academic rigour. The authors also assessed and addressed potential biases inherent in the AI-generated content. The final version of the paper is the sole responsibility of the human authors.

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Appendix 1: ENCORE+ OER Stakeholder Model (Farrow et al., 2023, 15)

	Users	Providers	Influencers	Governance
MACRO	Repositories, MOOC Providers, National/ International Education & Training Providers, Open Education Initiatives	Repositories, Publishers, Ed-Tech Companies, Infrastructure Providers, Technology Providers	Leaders, Broadcast Media, Policymakers, Funders, International Development Agencies, International Education Partnerships, Lobbyists, NGOs, Philanthropy	Policymakers, Management, Student Assessment & Testing Organizations, Standardization Bodies, Quality Assurance Agencies, Ministries
MESO	Repositories, Companies and Employers, Continuous Education Industry, Corporate Sector Lifelong Learning Initiatives Training Providers	Repositories, Publishers, Collections, Course Providers, Galleries, Libraries, Archives, Museums, Open Access Publishers, Open-Source Software Communities	Leaders, Broadcast & Social Media, Policymakers, Advocacy Groups, Charities, Education Associations, Open Data and Open Science Communities, Open Education Communities, Professional Associations, Professional Organizations, Researchers & Scientists, Student Organizations, Trade Unions and Labor Organizations	Policymakers, Management, Local Governments and Municipalities, Evaluators, Educational Authorities, Copyright and Intellectual Property Experts
MICRO	Repositories, Learners, Community-Based Organizations, Educators, Instructional Designers, Learner Support Services, Workers	Repositories, Publishers, Content Creators, Ed-Tech Startups, Libraries, Remixers	Leaders, Social Media, Policymakers, Advocates (for OER, inclusion, accessibility) Education Consultants, Institutional Actors, Learning Analytics Experts, Parents and Guardians, Private Foundations and Donors	Policymakers, Management, Copyright/Data Officers, Institutional Decision Makers Student Governments