

Global Trends on Adoption of Open Education Resources in Higher Education Institutions: A Bibliometric Analysis

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Abstract

The study examined the trends in the adoption and implementation of Open Education Resources (OER) in higher education institutions (HEIs) by conducting a bibliometric analysis of 911 publications between 2004 and 2022 from the Dimensions database. The VOSviewer1.6.19 software was used to establish visualization networks on the most influential authors, countries and universities. Further analysis was made to establish publications with higher citations, co-authorship collaborations and the co-occurrence of keywords. The results indicate a steady growth of research articles on OER due to the outbreak of COVID-19. The developed countries had a higher rate of research publications and stronger collaboration patterns in OER than the African countries. The analysis of citation score indicates that the “International Journal of Educational Technology in Higher Education” and “Journal of Interactive Media in Education” were the most popular journals on the topic. The results indicate that the United States of America, the United Kingdom and Spain had the highest links in terms of co-authorship collaboration. In contrast, African countries such as Uganda, Cameroon and Tunisia had very minimal links in terms of co-authorship on the topic. The analysis of keywords occurrence revealed several opportunities for adopting and implementing OER in HEIs which include easy accessibility of digital content and inquiry-based learning. Most of the identified limitations of the implementation of OER in HEIs in sub-Saharan African countries were the high costs of commercial e-textbooks and inadequate funding. Limited knowledge of the institutionalization of OER, institutional low capacity to adopt OER and lack of policies as well as awareness were identified as other factors constraining the effective implementation of OER. This bibliometric analysis provides insights on limitations for effective implementation and institutionalization of OER in HEIs in African countries and paves the way for future research direction on the topic.

Keywords: *Digital inclusion, digital divide, digital inequality, e-resources, distance learning, digitalization, remote learning*

INTRODUCTION

The interest in open education resources (OER) in many education institutions is growing very fast due to the increased use of digital content for learning and digitalization. The unforeseen increase and adoption of the use of OER in many educational institutions was witnessed during the outbreak of the COVID-19 pandemic. The COVID-19 pandemic pushed many educational institutions around the globe to abruptly shift their instructions digital and allowed learning to become more flexible and affordable for those who face medical, financial, and daily life challenges (Lee & Lee, 2021). Many educational institutions, particularly higher learning institutions (HLIs), paid more attention to OER adoption during the shift to online learning due to lockdown regulations imposed during the COVID-19 pandemic period (Menzli et al., 2022). Although there was a rapid shift to OER during the COVID-19 pandemic, many institutions faced many challenges including a lack of OER policies, lack of awareness and lack of proper monitoring and evaluation practices on the usefulness of OER (Marín et al., 2022; Mičunović et al., 2023). Some instructors in HLIs did not even know about OERs before the pandemic; this contributed to resistance of the adoption to support online distance learning (Sunar et al., 2022). A considerable number of studies indicate that instructors maintained a low level of value beliefs towards using OER due to limited knowledge, motivation and lack of trust on accuracy and comprehensiveness (Cheung et al., 2023; Clinton, 2019; Tang & Bao, 2022).

The existing evidence indicates that the adoption of OERs and open educational practices within higher education policy frameworks is still in its infancy as there is limited institutional leadership support, lack of digital culture and infrastructure (Murphy, 2013; Tlili et al., 2022). The way OER is perceived in many HLIs can give an impression that the implementation is inadequate due to limited understanding. Further evidence indicates that the implementation of OER is very minimal due to the fact that users, particularly students, face difficulties in finding the proper OER materials, and there are quality control issues with resources (Al abri & Dabbagh, 2018; Mishra, 2017). Other studies indicate that there are ethical violations among users due to limited knowledge, skills and lack of policy guidelines about the adoption of OER (Mncube & Mthethwa, 2022). In the context of this study, OER is considered as learning, teaching, and research materials in any format and medium that reside in the public domain or are under copyright license that permit no-

cost access and which can be reused, adapted and redistributed in HLIs repositories (Tanzania Commission for Universities, 2022; UNESCO, 2020b). Online learning in HLIs can be supported by the availability of OER in the institutional repositories. However, evidence indicate that many HLIs, particularly in developing countries, have no strong repositories due to limited time of preparation, lack of willingness to adapt and lack of adequate knowledge for preparations (Mtebe & Raisamo, 2014; UNESCO, 2020b).

Although some developing countries have started developing the guidelines on the adoption of the OER, still, one could notice several limitations which include a lack of compliance to legal and regulatory obligations from adoption. Others are the lack of institutional repositories, lack of learning management system (LMS) and lack of mechanisms to ensure the quality of adopted OER. In the Tanzanian context, for example, the guideline of online and blended delivery in HLIs emphasizes that universities should have in place an OER policy that allows the internal reuse of developed learning resources and adopt OER from other repositories for easy access of digital resources among students (Tanzania Commission for Universities, 2022). While the guideline is clear about accessibility of OERs, still, many universities in Tanzania face several challenges such as a lack of reliable internet, lack of adequate computer labs and lack of systems that can support the accessibility (Mtebe et al., 2021; Mwinyimbegu, 2019; Ndibalema, 2022). Further evidence indicates that universities in developing countries face several other challenges that limit easy accessibility of OER. Such challenges include students' lack of computer skills, limited pedagogical skills among instructors to prepare the resources and limited access to digital resources (Mengistie, 2021; Tanyanyiwa & Madobi, 2021). With these challenges, some students prefer print materials over online resources due to the complex nature of the rural environment which has limited infrastructure and technological development (Mahai, 2022; Mengistie, 2021; Samzugi, 2019). Limited accessibility, affordability and availability of OER is significantly exacerbated by the prevalence of digital divide which has been a critical problem in many HLIs in increasing inequalities in accessing OER (Mathrani et al., 2022; Zhong et al., 2021). It is clear that the prevalence of digital divide creates a paradox when institutional programmes emphasize on development of digital literacy among students while the digital spaces do not fully support such development.

While many global initiatives emphasize on inclusive digital education for enhancing digital literacy skills (European Agency for Special Needs and Inclusive Education, 2022; Q. Tang, 2015; UNESCO, 2020a), still, one could notice limited strategies available to ensure that every student can fully utilize technology to access OER. As a result, many students from HLIs in developing countries graduate with limited digital skills that can help them to cope easily with the world of work. There is no doubt that the utilization of OER should continue but digital transformation in HLIs is crucial. It remains unclear when this transformation will be achieved as the adoption of technological solutions in HLIs is slow. In addition, despite its importance in improving the quality of education, how instructors and students utilize OER in teaching and learning is still under-researched. Again, there is limited evidence regarding the trends on the adoption of OER in HLIs. Thus, the current bibliometric analysis synthesized the existing evidence to establish the global trends on the adoption of OER. More specifically, the analysis considered various opportunities and limitations about the adoption of OER over years. Yet, the adoption of OER in many HLIs is relatively new and evidence regarding its proliferation is scarce. Therefore, the current bibliometric analysis sheds light on how HLIs can benefit on the current evidence so as to unpack existing technological challenges to enhance smooth adoption of OER.

METHODOLOGY

The empirical articles included in the analysis were retrieved from the Dimensions scientific database. Dimensions database has been acknowledged as one of the scientific databases that provide greater sense of context of research and allows users to fulfill a significantly wider set of use cases (Hook et al., 2018). Data from the Dimensions database were exported on Feb 24, 2023. The search formula was based on the following criteria: “Adoption” AND “Open Education Resources” AND “Higher Learning Institutions” OR “Higher Education” OR “Universities” OR “Colleges.” The search for publications was limited to the period from 2008 to 2022. Further consideration was on the open access empirical articles based on the fields of research in education systems OR curriculum and pedagogy OR education OR education policy OR specialist studies in education OR information and computing sciences OR library and information studies.

Inclusion and exclusion criteria

The inclusion criteria were (a) empirical peer-reviewed on Open Education Resources (OER); (b) study population of students OR instructors in Higher Learning Institutions; (c) publication from 2008 to 2022; and (d) language (empirical articles published in English). The exclusion criteria were articles that (a) were not focusing on OER about students or instructors (b) did not use English as a publication language (c) review/literature review articles. After applying the filters and inclusion and exclusion criteria, the 12,793 documents the search had produced were reduced to 911. The exclusion procedures are summarized in figure 1 next

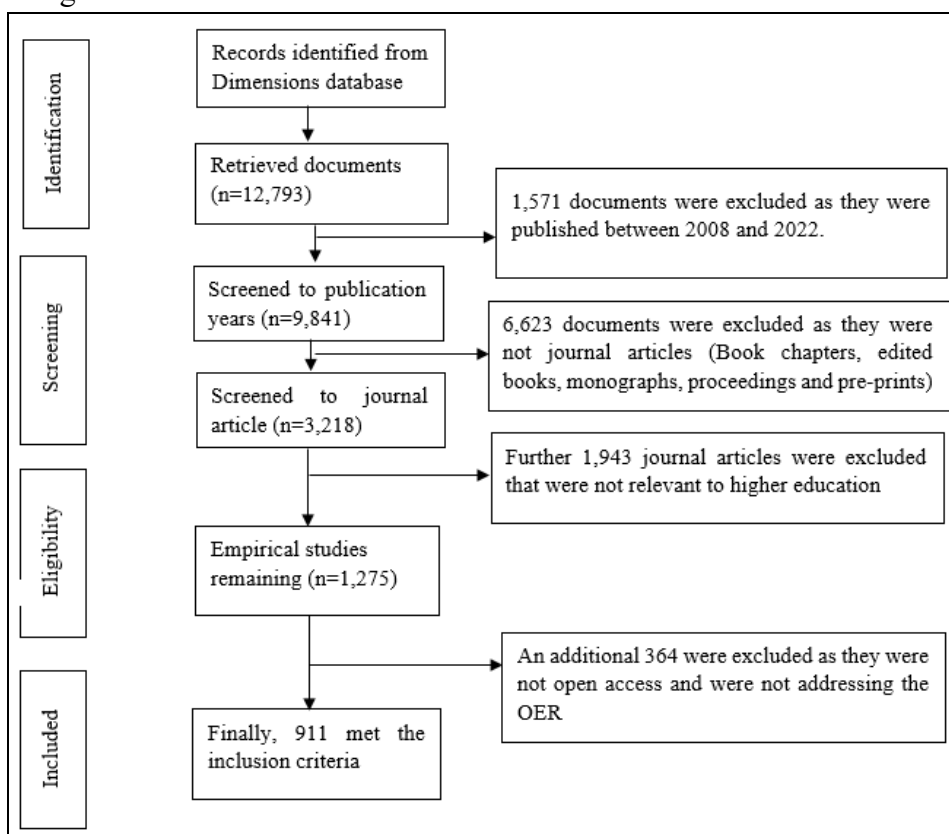


Figure 1: Flow diagram for the systematic review following the PRISMA statement

DATA ANALYSIS

The VOSviewer1.6.19 software was used to carry out visual analysis of the research articles. The networks visualization analysis of the co-

authorship and citation network was established. Further analysis included most prominent journals, authors, countries and organizations about the topic. The analysis about the co-occurrence of keywords was also conducted to identify terms associated with opportunities and challenges about the adoption of OER.

FINDINGS

The analysis was made on the trends on the number of publications per year from 2008 to 2022 on the growth of OER in HLIs. The trends on the growth is reflected in Figure 2

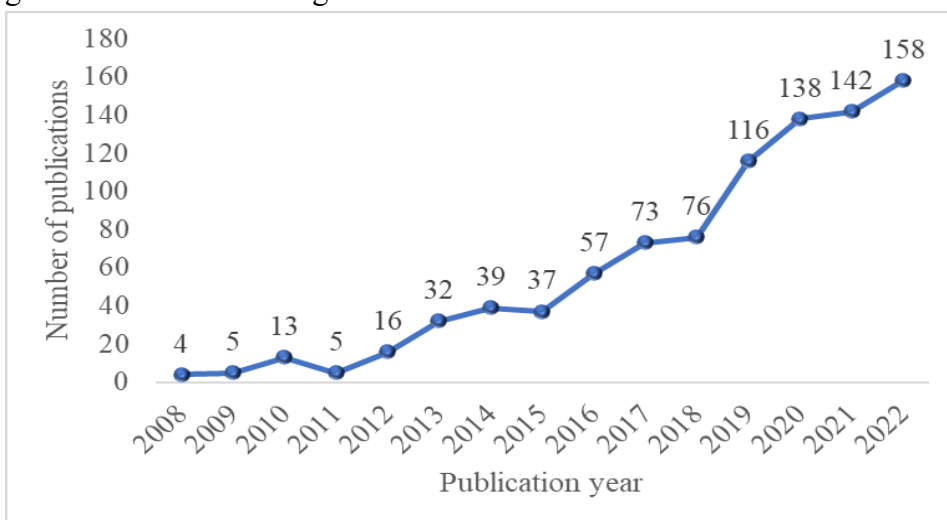


Figure 2: Annual number of publications about OER

Data in figure 2 indicates that there has been an increase in publications about OER in HLIs over the years. The rate of increase between the years 2019, 2021 and 2022 is higher than in other years. This can be contributed by a higher rate of transition to online distance learning among many HLIs due to outbreak of COVID-19 pandemic.

Co-authorship links

The analysis involved a minimum of 2 articles and 3 citations of an author where out of 1879 authors, 162 met the thresholds. For each of the 162 authors, the total strength of the co-authorship links with other authors was calculated and authors with the highest links were selected. Table 1 highlights top 10 authors with the highest total links.

Table 1: Most prominent authors about the topic

Rank	Name of author	Number of publications	Citations	Total link Strength
1	Huang Ronghuai	7	239	26
2	Tlili Ahmed	7	239	26
3	Burgos Daniel	9	310	23
4	Nascimbeni Fabio	8	264	22
5	Weller Martin	10	144	21
6	Pitt Rebecca	7	76	20
7	Hilton John	12	694	17
8	Admiraal Wilfried	5	58	16
9	Baas Marjon	4	36	16
10	Chang Ting-wen	3	203	16

Further analysis was made to establish the network visualization about the co-authorship links. The network visualization is presented in figure 3

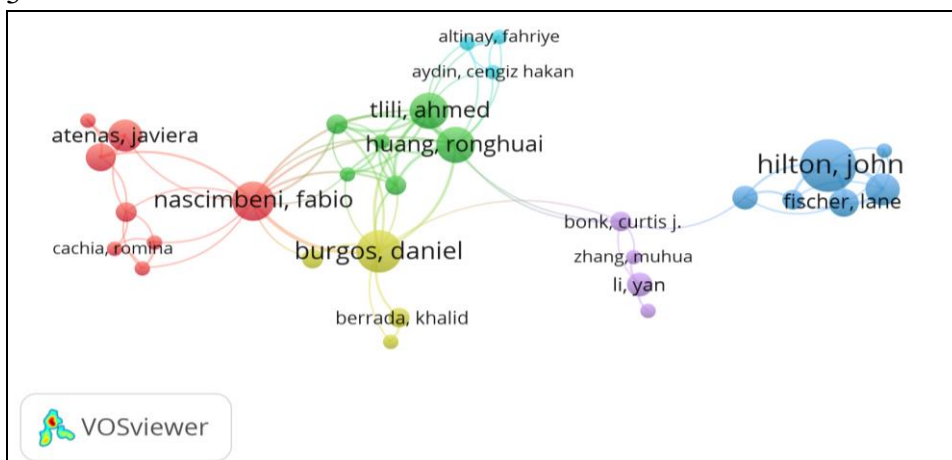


Figure 3: Network visualization of co-authorship links

The results indicate that Huang Ronghuai, Tlili Ahmed, Burgos Daniel, Nascimbeni Fabio and Hilton John had the highest co-authorship strong links in the field of OER. The results indicate limited co-authorship collaborations of authors from sub-Saharan countries.

Co-Authorship analysis by organizations

The analysis was made based on the minimum of 2 articles and 3 citations per organization. Of the 645 organizations, 164 met the thresholds. Institutions with strong links in terms of co-authorship are presented in figure 4

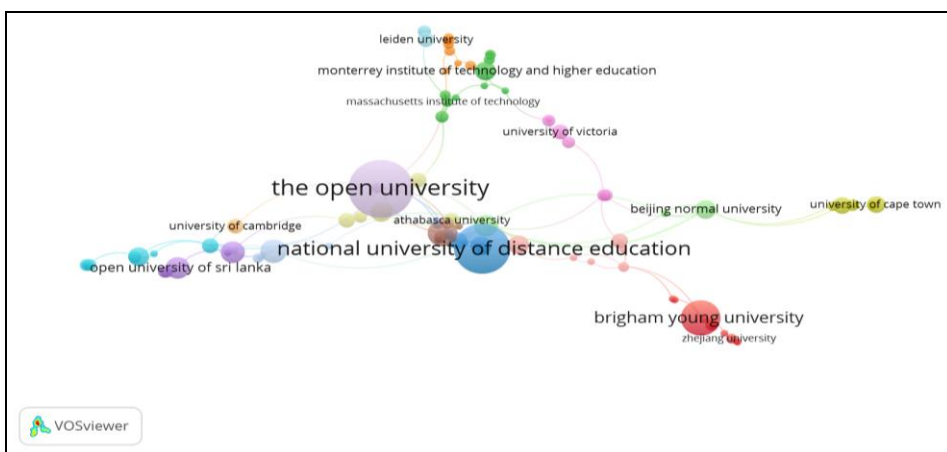


Figure 4: Network visualization of co-authorship by organisation

The results in figure 4 indicate that the Open University, national university of distance education and Brigham young university had strong association in terms of co-authorship. The University of Cape Town was the only university with some co-authorship collaboration from sub-Saharan Africa. The prevalence of few universities from sub-Saharan Africa could be an indication of low adoption of OER.

Co-authorship analysis by countries

The analysis was based on the minimum of 2 articles of a country and 3 citations. Of the 96 countries, 58 met the threshold and selection considered countries with the greatest total links as indicated in Figure 5.

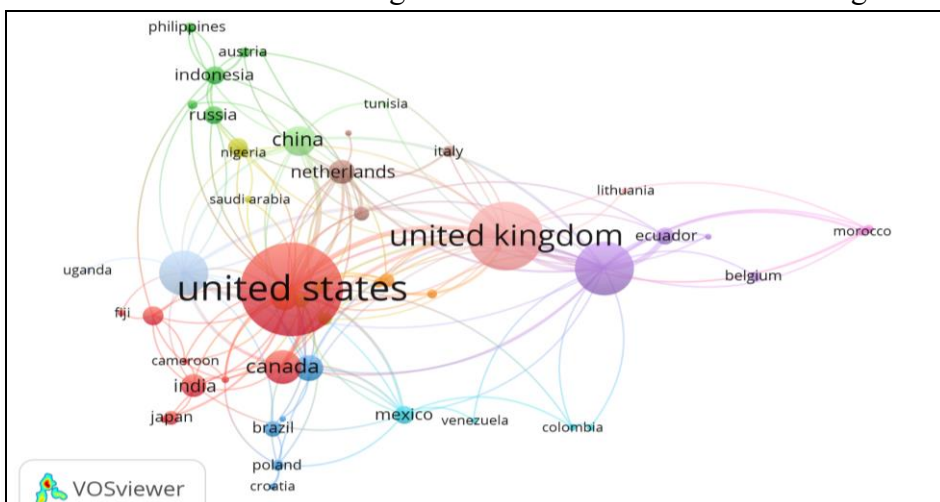


Figure 5: Network visualization of co-authorship by countries

The results indicate that the United States of America, United Kingdom and Spain had the highest links in terms of co-collaboration. African countries such as Uganda, Cameroon and Tunisia appeared to have very minimal links in terms of co-authorship on the topic.

Most influential journals about the topic

The analysis was based on the minimum number of 5 citations of which 55 journals met the threshold out of 296 journals. Table 2 presents the top 10 journals with highest citations on the topic.

Table 2: Distribution of articles by journal with total highest links

Rank	Journal	Articles	Citations	Quartile	H-Index	SJR
1	International journal of educational technology in higher education	23	802	Q1	49	2.05
2	Journal of interactive media in education	46	504	Q2	12	0.64
3	Distance education	16	435	Q1	63	1.88
4	Sustainability	14	421	Q1	136	0.66
5	Educational technology research and development	14	380	Q1	101	1.52
6	Computers and education	8	292	Q1	215	3.68
7	Smart learning environments	11	242	Q1	24	0.97
8	Journal of computing in higher education	7	221	Q1	47	1.34
9	Education and information technologies	23	199	Q1	61	1.25
10	International journal of emerging technologies in learning	19	88	Q2	39	0.54

The results in Table 2 indicate that “International journal of educational technology in higher education”, “Journal of interactive media in education”, “Distance education” and “Sustainability” are the most leading journals with the highest citations. Again, all journals were under quartile one and two.

Keywords analysis

The analysis of keywords was based on the minimum 5 key terms occurrence in all articles. Out of 14688 terms, 907 met the threshold. The analysis was also based on the default choice of 60% of most relevant terms whereby 544 words were selected. The results are presented in figure 6

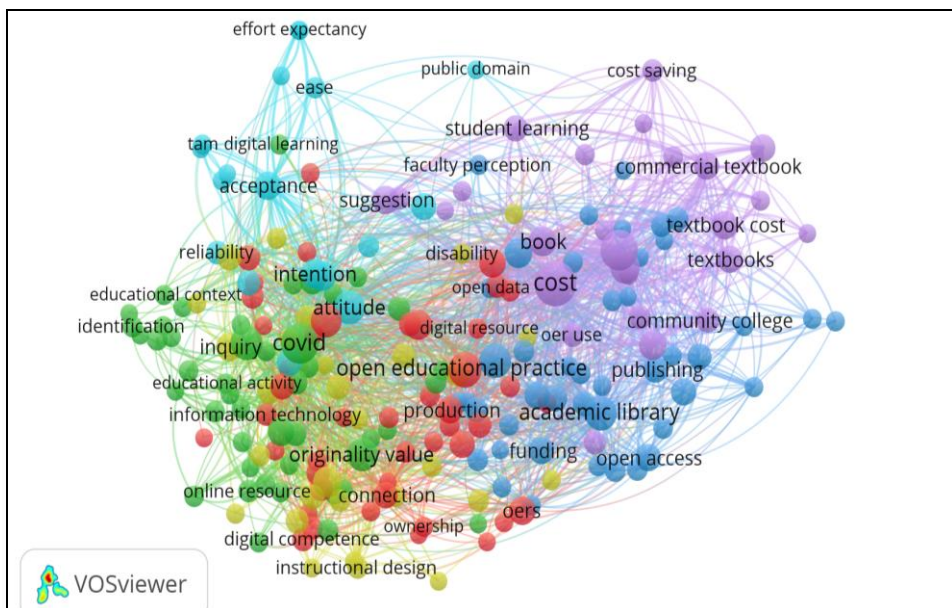


Figure 6: Bibliographic coupling of occurrence of keywords about OER

The results indicate several opportunities of adopting and implementing OER in HEIs. These opportunities include easy accessibility of digital content, improved digital competence, increased digital resources and inquiry-based learning. The results also indicate some limitations which include limited access of OER among students with disabilities, high costs of commercial e-textbooks and inadequate funding. Limited knowledge in institutionalization of OER, originality value and privacy policies were identified as other factors constraining effective implementation of OER. It is also remarkable that the term like 'COVID' stood out in the patterns which could suggest that it impacted the growth of OER in most HLIs.

DISCUSSION

The findings indicated that there were limited collaborations in terms of co-authorship, particularly authors and universities from sub-Saharan countries. It was also figured out that the developed countries such as the United States of America and the United Kingdom were the most active countries with high production and co-authorship links. This is an

indication that there is limited international cooperation which may contribute to inadequate understanding of several OER adoption practices in other contexts. Similar findings were revealed by (Tlili et al., 2021) who found that limited international cooperation in terms of co-authorship leads to limited understanding of educational practices across different cultural contexts. It is reported that OER is only limited to specific African countries, calling for more research and collaboration across countries globally so as to enhance more educational equity opportunities in educational institutions (Tlili et al., 2022). Lack of strong collaboration in publications may have some implications on the lack of opportunities to attract external funds and expertise that aim at solving global challenges. Despite the African Union emphasis on digital transformation in universities through investments and strengthening the international collaborations in terms of research and innovations (African Union, 2015), the universities give it low attention. Most HLIs in sub-Saharan Africa are experiencing digital inequalities which in turn leads to limited adoption of OER and other digital solutions in learning (Hartmann & Shajek, 2023). It makes sense to note that university potency and ranking is measured through various indicators such as international collaborations, innovations, research, visibility and academic partnerships. If universities in sub-Saharan Africa need to attain higher ranking, strengthening technological systems is not an option.

While the digital transformation strategy in Africa emphasizes on promoting policies and strategies that support cooperation in the use of OERs to promote access to educational content (African Union, 2019), the current study indicates that some universities have not adopted and institutionalized the OER policies. Other researchers note that the existing inequalities in the global and local educational networks discourage the production and dissemination of OER in most developing nations (Mishra et al., 2022). The adoption and implementation of OER in some institutions is constrained with several factors such as lack of knowledge, lack of skills, and lack of policy and guidelines about the adoption and development of OER (Mncube & Mthethwa, 2022; Mwinyimbegu, 2019). Most HLIs in sub-Saharan Africa cannot afford the costs of commercial e-textbooks due to inadequate funding. Universities in Tanzania, for example, face inadequate funding due to decreasing budget and disbursed funds which compromises the quality of services, including limited adoption of digital learning solutions such as OER which require funds (Mgaiwa, 2018). The adoption of digital learning solutions and digital

transformation in HLIs is greatly affected by a lack of funding and budgetary constraints; most developing countries have been more vulnerable (Gkrimpizi et al., 2023).

The findings indicate variations between developed and developing countries, whereby developed countries such as the USA seem to be ahead. This demonstrates the value of having strong collaborations and partnerships so that varying strategies can be integrated to uplift the implementation of OER. Gaining an understanding through partnerships could be essential as actors in HLIs could learn from each other and link the learning benefits of OERs to students. However, it is argued here that these cannot be achieved if there are no clear policies guiding international collaborations and willingness to share professional culture. This study prompts further dialogue and encourages more educators to consider creating more international links which could facilitate effective adoption of more technological solutions and new developments such as OER in their teaching.

Although the current study indicates the growth on the adoption of OER in HLIs during COVID 19, still, one could notice several constraints that limited its implementation. Several empirical studies report lack of awareness, lack of technical skills to develop OER, unfamiliarity of open source software that can support the adoption of OER, and some OER are published online without knowing the reliability of the authors (Huang et al., 2020; Mičunović et al., 2023). Other challenge affecting the developing countries is unequal access to internet by educators and learners. This is due to problems related to network coverage, especially for learners located in rural areas, or sometimes a lack of equipment and lack of digital skills among educators to implement OER (Ouahib et al., 2023). It is likely that educators and learners who lack exposure and digital culture may feel less confident in adoption of OER. The preparation of OERs to some instructors seems to be an overwhelming task when there is no technical support to help them.

Some universities in developing countries in particular did not migrate to online distance learning during COVID-19 pandemic due to lack of pedagogical competencies among instructors, unavailability of LMS to support the sharing of OER and unreliable internet accessibility (Makafane & Chere-Masupha, 2021; Mtebe et al., 2021; Ndibalema, 2022). Better adoption of OER in HLIs depends on a number of factors

including adequate investment in digital spaces for learning where there should be systems to support easy accessibility. The adoption of OER demands more intellectual work on the instructors' side in comparison with the adoption of a new commercial textbook (Wang & Wang, 2017). Thus, students and instructors may be motivated to OERs if they are easily accessible and decreased costs to access them (Allen, 2023). However, some scholars have cautioned that instructors should not be satisfied only by consuming the materials available on the various open digital platforms alone, but they should also participate and contribute to the creation of content and its distribution to others (Menzli et al., 2022). This is an indication that the sustainability of adoption of OER depends on instructors' ability to create and develop relevant materials to students' learning.

It is urged that HLIs should promote the integration of OER into curriculum, support capacity building, create awareness, ensure development, storage and accessibility (UNESCO, 2019). This has not been achieved in many HLIs particularly in developing countries where students have shortage of digital devices to access electronic materials (Mengistie, 2021; Mushimiyimana et al., 2022; Ouma, 2019). As a result, students prefer to rely on printed materials while ignoring the electronic ones (Samzugui, 2019; Tanyanyiwa & Madobi, 2021). Nonetheless, we cannot ignore the suggestion by Mncube and Mthethwa (2022) who emphasize on considerations of peer review process when publishing OER to ensure their quality and relevance. There is no doubt that if OER are well prepared, it is possible that many students and instructors could benefit from them. If properly integrated into the curriculum, there is a high chance to increase accessibility and improve instructional quality (Griffiths et al., 2022). The findings of the current study also revealed other several opportunities which include the possibilities of improving inquiry-based learning among students, digitalization, improved digital competence, and increased digital resources. In addition to these benefits, other scholars report several other opportunities which include expanded access to knowledge, supporting lifelong learning, pedagogical benefits, time saving and enhancing students' learning outcomes (Adil et al., 2022; Islim & Cagiltay, 2016). Furthermore, the implementation of OER is perceived to increase the accessibility of digital resources, cost-effectiveness, flexibility, and autonomy in learning (Lee & Lee, 2021; Nguyen & Tam, 2023). It makes sense to note that although there are several benefits regarding the adoption of OER, there is limited evidence

regarding its potentiality. The implementation of OER in HLIs has not been fully explored, which calls for further research.

CONCLUSION AND RECOMMENDATIONS

The current study indicates some learning opportunities as a result of adoption and implementation of OER. It is perhaps appropriate to see both instructors and students reflecting on their professional growth through OER. Through such opportunities provided by OER, students are more likely to develop skills needed for their future careers. The analysis found that the adoption of OER provides an avenue for self-directed learning and inquiry-based learning which are essential in strengthening individual competence. Yet, HLIs particularly in developing countries give less priority to OER as there are no clear policies in place and limited investments in technological systems that can support the implementations. HLIs in developing countries lack strong collaborations with other international institutions that can support the adoption. It is noteworthy that many students in HLIs have better technological skills but they lack institutional support to build strong awareness on the acquisition of OER. This can be intimidating to their digital well-being and their ability to develop 21st century skills.

Engaging students in acquisition of OER has the potential to help them develop more digital literacy skills to use in daily life. However, this has been the missed opportunity due to inadequate emphasis in adoption of technology in HLIs. Students need to be supported to appreciate the value of OER. If students have developed awareness to take advantage of opportunities provided by OER, learning inequalities are likely to be minimized. Strengthening institutional collaboration, institutional policies, technology infrastructure, internet accessibility, instructors and students' capacity would fuel the adoption of OER in HLIs. This bibliometric analysis provides some insights to HLIs about opportunities and stumbling blocks which could be used as a reference point for universities that need to adopt and implement OER. This study has clearly indicated that collaboration between institutions is essential in enhancing effective adoption and implementation of OER.

The results of the current bibliometric analysis suggest that there are limited studies on OER in HLIs in developing countries due to lack of awareness and policies. However, the current review did not critically highlight possible psychological impact among students who fully rely on

OER in their learning. Future research may capitalize on this and address some possible psychological impact of engaging students in OER. Again, the current review employed a bibliometric analysis of research articles from the Dimensions database only while focusing on HLIs. Future research may consider other levels of education while reflecting on other sources than empirical articles only.

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