Assessing the Visibility and Accessibility of Open Educational Resources (OER) in Malaysian Higher Education: A Web-Based Evaluation of Quality, Content and Infrastructure

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Open educational resources (OER) facilitated by information and communication technologies offer a transformative platform to enhance teaching and learning processes. OER has become an essential tool in education, enabling communities of users to consult, adapt, and utilize resources for non-commercial purposes. During the COVID-19 pandemic, Open Educational Resources (OER) assumed a pivotal role in supporting the development and dissemination of both newly created and adapted teaching and learning materials. One of the key advantages for educators and academics lies in the flexibility to select and tailor resources that align with diverse instructional requirements. This study investigates the current landscape of OER initiatives in Malaysian higher education through a comparative web-based analysis of 36 leading universities listed in the QS Asia University Rankings. The research identifies patterns using an OER evaluation checklist, which includes criteria such as platform hosting, accessibility, search interface, resource guides, subject alignment, repositories, copyright practices, licensing, and metadata standards. The findings offer valuable insights for educators, institutions, and policymakers to enhance OER integration, support sustainability, and promote broader adoption of open education. In addition, the results underscore the need for coordinated efforts to strengthen OER initiatives within higher education institutions and to provide a benchmark for national and institutional progress.

Keywords: Open Educational Resources (OER); OER Integration; Open Education; Malaysian Higher Education

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BACKGROUND

Open Educational Resources (OER) represent a transformative approach to enhancing access to education and fostering innovation in teaching and learning. Defined broadly, OER includes a wide range of freely accessible and openly licensed materials such as complete courses, course modules, textbooks, streaming videos, tests, software, and other educational tools and techniques designed to support knowledge dissemination and acquisition (Bliss & Blessinger, 2016; UNESCO, 2021). The central ethos of OER is its open nature, which enables materials to be freely accessed, reused, repurposed, adapted, and redistributed by educators, learners, and other stakeholders.

The concept of OER has evolved significantly over the past two decades, driven by advancements in information and communication technology (ICT). These technologies enable the open provision of educational resources, creating opportunities for consultation, adaptation, and use by a global community for non-commercial purposes. This open-access model is a powerful platform for improving the effectiveness of teaching and learning processes by promoting collaborative knowledge sharing, enhancing curriculum relevance, and reducing educational inequities. By providing unrestricted access to high-quality learning materials, OER has the potential to democratize education, particularly in regions where resource constraints limit traditional educational opportunities (UNESCO, 2007, 2021).

Moreover, Open Educational Resources (OER) encompass a wide array of teaching, learning, and research materials disseminated across diverse formats and media. These resources are either in the public domain or released under open licenses, such as Creative Commons licenses, which explicitly permit free access, use, adaptation, and redistribution with minimal or no restrictions (Wiley et al., 2014). This licensing framework empowers educators and learners to adapt resources to local contexts, ensuring relevance and inclusivity in diverse educational environments. Open educational resources (OER) are inextricably linked to developments in open science, given the heightened importance of access to knowledge in education worldwide (Ramirez-Montoya, 2020). With this broader view of open education, higher education institutions are actively using open educational resources and scientific practices to improve institutional performance and increase their impact on the learning ecosystem (Gallagher et al., 2019).

The widespread adoption of OER has substantially contributed to the democratization of access to high-quality open education. Within higher education, the integration, expansion, and sustained development of OER through information and communication technologies have progressively transformed educational practices by enabling the effective use of openly licensed learning resources (Essmiller & Asino, 2021; Katz, 2019; Todorinova & Wilkinson, 2020). The global adoption of Open Educational

Resources (OER) has advanced significantly, driven by the principles of open access to knowledge and the democratization of education. However, within the Malaysian context, the challenges of integrating OER into higher education institutions (HEIs) present unique obstacles that differ from those faced in other international settings. Despite growing global momentum, Malaysian higher institutions have struggled with issues such as a lack of awareness, insufficient policy frameworks, and limited resources dedicated to OER initiatives.

While international studies have highlighted the potential of OER to enhance educational access, cost efficiency, and lifelong learning opportunities, Malaysian higher institutions face hurdles that slow the adoption and integration of these resources. The existing literature highlights the benefits and challenges of OER in a more developed educational infrastructure (Abad-Segura & González-Zamar, 2021; Bond, 2020; Dos Santos et al., 2016; Fulgencio, 2018; Jing et al., 2024; Santos-Hermosa et al., 2022; Wright, 2018). These challenges, including a lack of institutional and stakeholder support, resource constraints, and the need for more comprehensive national OER strategies, underscore the critical need to examine the specific landscape of OER implementation in Malaysia.

There is a critical gap between Malaysia and the rest of the world. Malaysian institutions face distinct obstacles such as limited awareness, inadequate policy frameworks, and resource constraints, which differ from those encountered in international contexts (Abeywardena et al., 2013; Ahmed & Othman, 2021; Brimo, 2019). Despite the growing recognition of OER's potential, its implementation in Malaysian HEIs remains fragmented. Key challenges, such as low faculty engagement, inconsistent infrastructure, and inadequate accessibility compliance, hinder its widespread adoption. Addressing these gaps requires systematically evaluating OER initiatives across institutions to identify the best practices and innovative approaches that could be adapted to the Malaysian context. This study can improve its clarity, impact, and contribution to the domain of open educational resources by addressing these areas. It would also significantly enhance its academic rigor and practical relevance.

RESEARCH OBJECTIVES

This study aims to contribute to the growing body of knowledge on OER by examining its adoption and implementation in Malaysian universities, with a focus on their web presence and alignment with international OER standards. This study seeks to provide actionable insights to inform policy and practice, fostering a more inclusive and sustainable open education ecosystem in Malaysia by understanding the current state of OER initiatives.

The following research objectives were formulated:

- To systematically examine and map the current landscape of Open Educational Resources (OER) initiatives in Malaysian higher education institutions through a structured web-based analysis of institutional websites

- To evaluate how Malaysian higher education institutions present and align their OER web initiatives with the OER Evaluation Checklist, with specific emphasis on the dimensions of quality, content, and infrastructure.

LITERATURE REVIEW

OER and Higher Institutions Trends

This literature review synthesizes findings from recent studies and reports, focusing on the practices, challenges, and implications of global OER adoption with specific attention to the Malaysian context. Current trends in the adoption of open educational resources (OER) across different regions reflect a diverse landscape influenced by varying levels of institutional support, awareness, and technological infrastructure. The global education landscape is shifting toward open and flexible learning models, underscoring the importance of OER. Institutions and policymakers are increasingly recognizing the role of OER in addressing challenges, such as rising textbook costs, disparities in access to quality education, and the need for continuous learning in a rapidly changing world. OER not only reduces financial barriers for students but also fosters a culture of collaboration and innovation among educators by enabling them to share best practices and co-create teaching materials.

Moreover, the COVID-19 pandemic has further highlighted the significance of OER as educational institutions worldwide transitioned to online and hybrid learning environments during the pandemic. Accessing and adapting open resources has become critical for maintaining educational continuity, particularly in regions with limited access to physical learning materials. The adaptability and scalability of OER make it an invaluable tool for responding to such disruptions, ensuring that learning remains inclusive and resilient. Many higher education institutions worldwide recognize the importance of OER in improving educational access and equity. Institutions are increasingly developing formal policies that support OER initiatives and provide frameworks for faculty members to create and share open resources (Baker & Lindburg, 2021). This trend is evident in regions such as North America and Europe, where universities have established dedicated OER offices and funding mechanisms to encourage faculty participation (Tlili, Garzón, et al., 2023). The current landscape of OER adoption reveals both the progress and challenges across different regions. Although there is increasing commitment from institutions globally to integrate OER into curricula

and foster collaboration among stakeholders, barriers related to awareness, quality assurance, and institutional support remain significant hurdles. In Malaysia, OER holds significant potential to address national educational goals, particularly those related to equity, inclusivity, and digital transformation. With an increasing government and institutional focus on open education, Malaysian universities are exploring innovative ways to integrate OER into their teaching and learning ecosystems. However, challenges such as varying levels of awareness, infrastructure readiness, and copyright compliance must be addressed to realize the full potential of OER in the country.

OER Policy Framework

National and institutional policy frameworks should actively encourage the involvement of underrepresented groups in OER creation, including individuals from rural contexts, non-traditional learners, and educators from resource-constrained institutions. This can be facilitated through targeted funding mechanisms for OER initiatives that address the specific needs of these communities, the provision of capacity-building workshops and training programs in OER development and use, and the prioritization of diverse perspectives in OER development. Furthermore, institutional policies should support the translation and adaptation of OER into multiple languages and formats to increase their accessibility and discoverability. Institutional policymakers should consider establishing funding programs dedicated to OER initiatives, with a focus on departments involved in developing and releasing open resources. These programs could include grants for OER development, technological infrastructure, and staff training in open licensing and digital platforms. The absence of robust institutional policies that support OER initiatives can hinder progress. This issue is prevalent not only in Malaysia but also in other regions where institutional commitment is crucial for successful OER implementation.

Open and distance education within Malaysian higher education institutions seeks to enhance the productivity and employability of Malaysian citizens by expanding access to formal learning opportunities for adult learners. In this context, the adoption, expansion, and institutionalization of OER, supported by information and communication technologies, are intended to transform educational practices through the effective use of openly licensed educational resources. Several higher education institutions in Malaysia have participated in OER initiatives. However, there is still a lack of widespread understanding of OER and open licenses in the country because specific guidelines are still lacking (Soon Fook, 2019). Gisip et al. (2024) found that suggests that awareness of the benefits of OER among Malaysian students and teachers was relatively limited. However, awareness has gradually increased, particularly among academics, who increasingly recognize the pedagogical value of OER and their integration with educational technologies (Mohammed et al., 2024).

Given the potential of OER to improve the quality of teaching and learning, reduce private education costs, and increase access to lifelong learning opportunities, the national consultation of OER stakeholders has recommended that education ministries in Malaysia adopt detailed guidelines for OER in higher education institutions. Since 2019, UNESCO has worked closely with the Ministry of Higher Education, core experts, and key stakeholders in Malaysia to develop policy guidelines and build the capacity for inclusive OER development based on the principles of Universal Design for Learning (UDL) (Huang et al., 2020). The National Inclusive Open Educational Resources (iOER) Policy, launched by the Ministry of Higher Education (MoHE) in 2021, aims to ensure inclusive learning opportunities for all learners in Malaysia. This innovative policy aligns with the implementation of the 2019 UNESCO Recommendation on OER adopted by the UNESCO General Conference in its 40th session.

Institutional Support and Infrastructure

Inclusive Open Educational Resources (iOER) were established in a Malaysian national policy statement to provide guidance on the design, development, and use of iOER. It aims to improve access to and support quality teaching and learning in Malaysian higher education under a Creative Commons license that includes content, activities, and resources that are adaptable to everyone's individual needs and has no or minimal barriers (Soon Fook 2019). The long-term vision of this national policy on inclusive open educational resources (iOER) is to ensure the adoption of iOER by Malaysian higher education institutions to provide high-quality educational access for all learners, particularly those with disabilities. It concerns increasing access to and supporting high-quality teaching and learning in Malaysian higher education under this Creative Commons license.

The widespread use of OER significantly democratizes access to high-quality open education. Additionally, this national policy applies to all institutions in the provision of teaching and learning materials (Bhandigadi, 2020; Zainuddin et al., 2017; Zuhairi et al., 2020). To achieve this, higher education institutions in Malaysia have joined the OER movement to harness the full potential of open access to educational content to support online and distance learning, which is especially important during the outbreak of the COVID-19 pandemic (Ossiannilsson, 2021) to utilize OER to enrich learning experiences. Malaysian higher education institutions have launched the OER platform through a dedicated Massive Open Online Courses (MOOCs) web presence, Massive Open Online Courses (MOOCs) via Open Learning Platform, Micro-Credential Courses, and Open Courseware (OCW) Platform (Nurul Diana et al., 2022).

In 2019, Malaysia implemented an iOER policy and initiated various OER initiatives. Overall, Malaysia's policy and practice environment is receptive to OER, and there is a need to develop policy guidelines to support universities and teachers in integrating OER

into their teaching and learning activities. The availability of Malaysian MOOCs is another significant opportunity to enhance Malaysia's status as a knowledge creator by sharing courses under open licenses for reuse and adaptation in as many practical ways as possible. Bhandigadi (2020) highlighted that the introduction, expansion, and cultivation of OER using information and communication technology in Malaysian education will transform educational practices through the effective use of educational resources with open licenses. The transformative potential of open licenses lies in the expanded pedagogical possibilities they afford, enabling learners to revise and remix content, engage in active learning, and develop knowledge through curation and content creation.

Incorporating OER into e-learning can transform education by expanding access, reducing costs, promoting collaboration, and fostering innovative teaching and learning (Gisip et al., 2024). As a way forward for OER, sustainability is critical to the future of OER and of education more broadly, yet it is often overlooked. Sustainability is a critical factor for ensuring the success of OER initiatives. According to Tlili, Nascimbeni, et al. (2023). The sustainability of OER projects in universities will be achieved by integrating OERs into the everyday fabric of the university's business, whether in teaching and learning, research, and/or business and community engagement activities. Without sustained efforts in funding, policy support, and community engagement, OER adoption risks shift from long-term to short-term. By making a long-term commitment, encouraging community engagement, ensuring quality, and advocating for supportive policies, educators' roles as OER experts can contribute to the sustainability and growth of OER initiatives.

METHODOLOGY

Study Design and Sampling

This study employed a quantitative, descriptive research design, focusing on web analysis, to evaluate the implementation of Open Educational Resources (OER) in Malaysian universities. The study sample comprised 36 leading Malaysian universities, selected based on their inclusion in the QS Asia University Rankings 2024, thereby ensuring representation of institutions with significant academic standing and potential for OER initiatives. Therefore, this purposive sampling method targeted universities most likely to adopt OER practices, providing a focused lens on leading institutions in the Malaysian higher education landscape. Through a systematic web-based analysis across 36 top Malaysian universities, the findings provide valuable insights for policymakers and educators to strengthen OER integration, enhance institutional support, and promote sustainable open education practices. The evaluation was conducted over seven months, from January 1, 2024, to July 31, 2024. The primary data collection involved an extensive web analysis of each university's official website and related OER platforms. A web-based analysis was chosen as it can directly evaluate publicly available OER platforms, offering

insights into accessibility, metadata quality, and licensing transparency. Previous studies (Mishra et al., 2022) have validated web content analysis as an effective method for benchmarking institutional OER engagement. The analysis was also guided by an OER Evaluation Checklist, carefully adapted from multiple authoritative sources to ensure a comprehensive assessment of OER practices and compliance across institutions.

OER Evaluation Checklist and Data Collection

The OER Evaluation Checklist served as the cornerstone for data collection and analysis, incorporating key criteria for evaluating the presence and quality of OER initiatives. The checklist was adapted from the following sources, each licensed under the Creative Commons (CC BY 4.0) license, enabling its modification and use in the context of this study:

i.   Checklist for Evaluating Open Educational Resources (OER) by Texas State University Libraries is licensed under CC BY 4.0.

ii. Checklist for Evaluating Open Educational Resources (OER)" by ACC Office of Instructional & Faculty Development is licensed under CC BY 4.0OER Accessibility Toolkit (with Accessibility checklist) By UBC https://open.ubc.ca/access/toolkits-access/oer-accessibility-toolkit/licensed under CC BY 4.0.

Quality: Ensuring Credibility, Accessibility, and Usability

The quality of OER resources is a fundamental determinant of their educational value, credibility, and effectiveness. High-quality OER must not only be accurate and reliable but also accessible, engaging, and adaptable to diverse learning needs. This dimension evaluates whether OER materials adhere to pedagogical best practices, technical standards, and accessibility requirements. A key quality indicator is accuracy and credibility, ensuring that OER materials are factually accurate, peer-reviewed, and sourced from reputable institutions or subject-matter experts. Additionally, research suggests that OER adoption increases when educators and learners trust the quality and reliability of the content (Wiley et al., 2014). Furthermore, accessibility compliance is another crucial component of quality, ensuring that OER is inclusive for learners with disabilities. Institutions must adhere to Web Content Accessibility Guidelines (WCAG), providing features such as screen reader compatibility, alt text for images, closed captions for videos, and adaptable text formats. Without these features, OER initiatives risk marginalizing students who rely on alternative access methods. Proper copyright and licensing compliance is also essential to ensure that OER materials can be legally reused, modified, and redistributed. Adopting open licenses, such as Creative Commons (CC BY, CC BY-SA), promotes a culture of sharing while safeguarding intellectual property rights.

1. *OER Guide:* A structured guide that directs users to a range of OER formats, including textual materials, videos, software, and other digital resources utilized by educators to support learners in meeting defined learning outcomes and instructional expectations. (Olcott Jr, 2012).

2. *Copyrights and Licensing:* According to Asschenfeldt (2004), a copyright license is an authorization by the copyright owner to enable another party to engage in behavior that would otherwise be the exclusive right of the copyright owner, but without transferring the title in those rights.

Content: Relevance, Alignment, and Discoverability

The content dimension of the OER Evaluation Checklist examines the scope, relevance, and discoverability of educational materials available within institutional OER platforms. This attribute assesses how well OER resources align with academic curricula, subject areas, and learning objectives while ensuring that they remain adaptable and user-friendly. Metadata and search functionalities play a pivotal role in the discoverability of OER. Well-structured OER metadata enhances search ability, indexing, and classification, ensuring users can easily locate resources based on keywords, subjects, authorship, and licensing information. A robust repository provides a centralized hub for OER access and incorporates quality-assurance mechanisms, citation tracking, and version control to ensure that content remains current and relevant for future use.

1. *Alignment of subject resources/courses:* A collection of subjects and courses divided into different subject areas. Each subject or course is described and indexed. A structured collection of subjects and courses organized across clearly defined disciplinary domains, in which each subject or course is systematically described and indexed using standardized metadata elements (Hilton, 2016).

2. *OER Metadata:* According to Stankovic et al. (2014) OER metadata are data used to describe the attributes of a resource. It is the secret sauce necessary to keep resources searchable and discoverable. Metadata improves the display of search results, thus making it easier for users to find the right web pages (Tavakoli et al., 2021).

3. *OER Repository:* A comprehensive digital repository that functions as a searchable platform, enabling users to retrieve OER by subject area or resource type. Through such repositories, OER are made openly accessible to learners and educators via the World Wide Web, thereby enhancing resource visibility, discoverability, and reuse. (Atenas & Havemann, 2014; Clements et al., 2015)

Infrastructure: Platform Readiness, Accessibility, and Sustainability

The infrastructure attribute assesses the technological and institutional capacity of higher education institutions to effectively host, manage, and sustain OER platforms. OER initiatives risk fragmentation, inaccessibility, and underutilization without a strong digital infrastructure. Institutions must establish dedicated, stable OER platforms that support a wide range of file formats, allow seamless integration with institutional repositories, and ensure high server uptime. The absence of robust hosting infrastructure often results in limited accessibility, slow loading times, and fragmented OER resources across university websites. Regular platform audits and accessibility testing will help address usability concerns and ensure continuous improvement.

1. Accessibility/Search Interface: The goal of web accessibility is to ensure that people with disabilities can use the web under equal conditions (Navarrete & Luján-Mora, 2018). In the OER field, accessibility is twofold: websites and educational resources. Accessibility is critically important for all learners and should be considered when designing online materials. Identification of specific characteristics will assist in determining whether materials are fully accessible to all students (Darling-Hammond et al., 2020).

2. Platform Hosting: An OER knowledge and information base, including a web portal, has been proposed as a series of knowledge repositories (Khanna & Basak, 2013). The OER platform is a web-based hosting site that provides access to various OER formats as teaching and learning resources (Hanna & Wood, 2011).

DATA COLLECTION AND ANALYSIS

This study examines how these institutions align their OER initiatives with the OER Evaluation Checklist across three dimensions: Quality, Content, and Infrastructure. The checklist encompasses a set of OER standard criteria grouped into three main attributes: Quality, Content, and Infrastructure, as proposed by Elias et al. (2020). This study adopts an evaluation framework for Open Educational Resources (OER) based on these three key attributes: Quality, Content, and Infrastructure. These attributes provide a structured approach to assessing the effectiveness and sustainability of OER in Malaysian higher education institutions. These criteria are essential to provide a comprehensive view of the state of OER in Malaysian universities. These attributes provide a comprehensive framework for assessing the effectiveness, accessibility, and usability of OER platforms, ensuring alignment with international best practices and institutional objectives. By incorporating these evaluation dimensions, the checklist provides a structured framework for analyzing the strengths, limitations, and opportunities for enhancing OER initiatives in Malaysian higher education institutions. This approach ensures that the study assesses

the current state of OER adoption and identifies critical areas for policy intervention and institutional improvement.

Data collected through web analysis were systematically recorded and organized using Microsoft Excel. Using Excel tables allowed for efficient categorization and analysis of checklist items across the 36 institutions. Each institution's performance was assessed based on the presence or absence of specific OER components and compliance with established standards. This structured approach enabled the identification of trends, gaps, and good practices in the Malaysian higher education system. Educators, academicians, and OER web administrators at institutions should continually improve the quality of distance education and increase its web accessibility in a well-organized and structured way. Furthermore, high-quality OER content can save teachers significant time and effort in resource development and advance student learning inside and outside the classroom (Abd-Rabo, 2022).

The combination of purposive sampling, rigorous evaluation criteria, and a structured analytical framework ensured the reliability and validity of the findings. By focusing on universities included in the QS Asia University Rankings 2024, this study targeted institutions with the resources and capacity to lead OER adoption, offering insights that can inform policy and practice in both national and global contexts.

FINDINGS

The OER Evaluation Checklist for web analysis focuses on three dimensions: Quality, Content, and Infrastructure. By evaluating OER initiatives against these dimensions, institutions are better positioned to ensure that their resources are accessible, legally compliant, pedagogically sound, and sustainable in supporting long-term educational impact. For instance, metadata compliance is evaluated based on attributes such as accessibility, discoverability, and alignment with curricular needs. However, the analysis may be limited by the dynamic nature of institutional websites and the variability in data availability. This finding aligns with the high potential of Malaysia for implementing effective OER delivery, as long as students' and academics' awareness and acceptance of OER are adequately addressed (Ibrahim et al., 2021). However, Malaysian higher education institutions face unique challenges that slow the integration of OER initiatives.

OER Initiatives Projects in Malaysian Higher Education

The findings suggest a favorable trajectory for OER development in Malaysia, with public universities functioning as primary drivers and reference points for private institutions. These indicators reflect emerging good practices in OER initiatives that support online teaching and learning among Malaysian educators. As awareness, acceptance, and institutional capacity for OER continue to expand, Malaysia appears

increasingly well-positioned to consolidate its role as a regional leader in open education. The findings, as presented in Table 1, highlight significant insights into the adoption and development of Open Educational Resources (OER) among Malaysian universities. A substantial 75% (27 out of 36) of these universities have demonstrated engagement with OER initiatives through their online presence, while 25% (9 out of 36) have yet to embark on OER-related projects. These figures underscore a promising trend toward OER adoption within the Malaysian higher education landscape, with most institutions recognizing the potential of open education to enhance learning and teaching experiences.

Table 1

OER Initiatives Projects (Yes/No)

36 Top Malaysian universities	OER Initiatives (Yes)	OER Initiatives (No)
Results	27	9
Percentage	75%	25%

A deeper examination reveals that public universities are at the forefront of these efforts, contributing 70% (19 of 36) of the identified OER initiatives. In contrast, private universities accounted for a smaller but significant 30% (8 out of 36). This disparity underscores the pivotal role of public institutions in pioneering the growth of open education and in advancing OER initiatives in the country. Public universities' prominent involvement may be attributed to their larger scale, broader access to government support, and greater alignment with national education policies that promote open and equitable access to knowledge. These findings also suggest that the increasing involvement of Malaysian universities in OER aligns with the country's potential to implement effective OER delivery systems. As noted by Ibrahim et al. (2021) The successful integration of OER in higher education hinges not only on institutional participation but also on addressing key factors such as students' and academics' awareness and acceptance of OER. Without adequate understanding and buy-in from these critical stakeholders, the long-term sustainability and impact of OER initiatives may be limited.

Moreover, the findings highlight examples of effective OER involvement practices, particularly those that support online learning. This is increasingly relevant as demand for flexible, accessible, and high-quality educational resources grows amid the digital transformation of education. Malaysian educators and institutions that have adopted OER demonstrate a commitment to fostering an inclusive and dynamic learning environment, contributing to broader efforts to reduce educational inequities. However, 25% of universities that have not yet engaged in OER initiatives constitute a gap in the

adoption landscape. These institutions may face barriers, including limited awareness, resource constraints, and difficulties aligning with OER policies. Addressing these obstacles is crucial for ensuring a more equitable distribution of OER adoption across all types of higher education institutions in Malaysia.

OER Evaluation Checklist Across Malaysian Higher Institutions

The analysis of the data derived from the OER Evaluation Checklist (Figure 1) offers critical insights into the current state of OER implementation across Malaysian higher education institutions. The findings provide a nuanced understanding of both progress and challenges, highlighting key strengths in metadata compliance and repository development while identifying significant gaps in accessibility and infrastructure readiness. A particularly notable finding is the high compliance rate (88%) with metadata records, making it the most prevalent and well-adopted aspect of OER implementation. This strong emphasis on metadata underscores institutions' recognition of the importance of standardization and discoverability in OER systems, which ensures that users can efficiently locate, categorize, and retrieve learning resources. Metadata compliance enhances interoperability, allowing seamless integration with digital repositories, Learning Management Systems (LMS), and global OER networks. Similarly, the establishment of institutional OER repositories (85%) reflects a strong commitment to resource centralization and long-term sustainability, demonstrating efforts to create structured platforms for OER dissemination.

However, these positive trends are overshadowed by significant gaps in accessibility (37%) and infrastructure readiness (30%), which pose major barriers to the usability and inclusivity of OER resources. The low accessibility compliance suggests that many OER platforms lack essential features, including screen reader compatibility, alternative text for images, closed captioning for videos, and mobile-responsive designs, thereby marginalizing users with disabilities and those relying on alternative access methods. Studies have shown that accessibility remains a critical determinant of equitable education, and failing to integrate universal design principles undermines the fundamental ethos of OER as an open and inclusive resource. Similarly, the low infrastructure readiness (30%) indicates a persistent challenge in institutions' capacity to host, maintain, and scale OER platforms.

Insufficient technological investment, outdated digital repositories, and inadequate server capabilities contribute to fragmented and unreliable OER systems. Without robust infrastructure, institutions struggle to ensure the sustainability and seamless operation of OER platforms, limiting their effectiveness in supporting digital learning environments. While high levels of metadata compliance and the establishment of institutional repositories signal commendable progress in standardization and resource discoverability, persistent gaps in accessibility and technological infrastructure require

urgent and systematic intervention. In the absence of accessible design and robust digital infrastructures, the benefits of standardization risk remaining largely symbolic rather than functionally transformative. Institutions must therefore prioritize targeted investments in accessibility compliance, platform enhancement, and adaptive technologies to support diverse learner needs and evolving pedagogical practices. Without such concerted measures, the long-term sustainability, scalability, and equitable dissemination of OER will remain constrained, ultimately limiting their capacity to realize meaningful educational transformation within Malaysian higher education.

Figure 1

OER Evaluation Checklist Across Higher Institutions
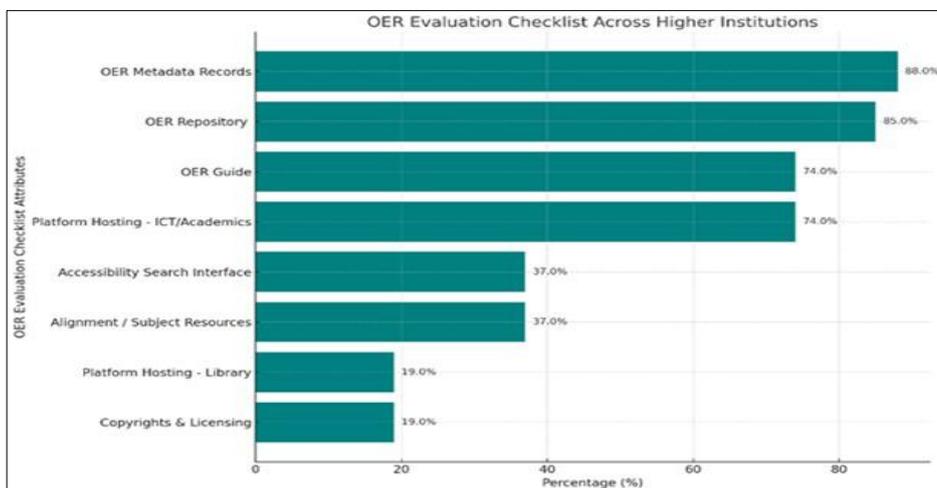
Accessibility and Search Interface

Limited infrastructure readiness (30%) indicates that many institutions lack the technological capacity to host and effectively manage OER platforms. Without proper accessibility and search interface measures, OER platforms risk marginalizing disabled users or those relying on alternative access methods. Interface design plays a pivotal role in the discoverability and usability of OER. Research by Atenas and Havemann (2014) and Tlili et al. (2023) highlights that poorly structured metadata, lack of keyword optimization, and inconsistent navigation features hinder users from efficiently locating relevant resources. Addressing these barriers requires investment in centralized OER repositories and enhanced interoperability across Learning Management Systems (LMS). A study by Mtebe & Raisamo (2014) reported that faculty and students often struggled with inadequate search functionality on OER platforms, which affected engagement and

uptake. A well-structured OER repository should integrate advanced search filters, multilingual support, and personalized recommendations to enhance user experience and encourage sustained engagement. Addressing these gaps requires a concerted effort to upgrade the technology infrastructure and conduct regular platform accessibility audits. By doing so, institutions can build an OER platform that is not only more inclusive but also resilient and user-friendly.

Hosting Platforms and Library Integration

The findings indicate that while 74% of institutions have established platforms for hosting OER, only 19% have integrated these platforms with their libraries. This highlights both progress and a critical gap in the institutional OER ecosystem. The high percentage of hosting platforms suggests a growing commitment to OER adoption, showcasing institutional willingness to support open education. However, the lack of integration with libraries represents a missed opportunity to optimize OER management, organization, and dissemination. Moreover, the limited integration of OER platforms with libraries (19%) indicates a structural disconnect between institutional OER strategies and library services. The lack of a cohesive system results in fragmented access to resources, duplication of efforts, and limited user engagement. Research by (Cox & Trotter, 2017) highlights that OER initiatives are more effective when embedded within existing academic infrastructures, particularly through library-managed institutional repositories. Libraries can facilitate long-term access, interoperability with Learning Management Systems (LMS), and alignment with academic policies, making them key enablers of OER adoption.

Strengthening library integration in OER platforms can significantly enhance discoverability, accessibility, and institutional ownership of open resources. This lack of integration represents a missed opportunity to leverage libraries as centralized hubs for OER management and dissemination. With their expertise in resource organization and user support, librarians are ideally positioned to play a pivotal role in OER ecosystems. Expanding library capabilities to host, manage, and curate OER can significantly enhance resource accessibility and sharing, ultimately strengthening the institutional OER frameworks (Calilung, 2021; Kimball et al., 2022; Shahara & Nowrin, 2023; Vogus, 2019). Institutions can bridge the gap between digital content and end users by expanding library capabilities to host, curate, and provide technical support for OER. This approach not only reinforces the sustainability of OER initiatives but also leverages libraries as active facilitators of knowledge sharing and digital transformation.

Copyright and Licensing Practices Concerns

Despite the high adoption rates of metadata records (88%) and repositories (85%), only 19% of the institutions demonstrated compliance with copyright and licensing

practices. This low compliance rate raises serious concerns regarding the legal clarity and reusability of OER resources. Without proper licensing, users may hesitate to adapt or share materials due to concerns about copyright infringement. Educating stakeholders about open licensing practices, such as Creative Commons, is essential to ensure compliance and foster trust in OER initiatives. This finding underscores the need for comprehensive training programs to educate stakeholders about open licensing frameworks, such as Creative Commons. Additionally, institutions should establish clear policies and guidelines to simplify the licensing process, ensuring that all OER materials meet legal and ethical standards (Asschenfeldt, 2004; Gumb, 2019; Morrison & Secker, 2015).

Faculty Engagement and Development

The findings also highlight limited faculty engagement in OER initiatives, with only 25% of the institutions reporting substantial involvement. This lack of engagement is often attributed to insufficient time, lack of awareness, and inadequate training. This low participation aligns with previous and existing research, which highlights key barriers such as time constraints, lack of awareness, and insufficient training (Allen, 2023; De los Arcos et al., 2016; Mićunović et al., 2023). Faculty members are key stakeholders in the creation, adaptation, and dissemination of OER, and their limited participation poses a significant challenge to the sustainability of OER projects. Addressing this issue requires targeted interventions, such as structured faculty development programs that emphasize the benefits and practical considerations of OER adoption. Collaborative platforms that simplify the OER creation process can help bridge this gap by fostering a sense of ownership among educators.

DISCUSSION

The discussion surrounding Open Educational Resources (OER) in Malaysian higher education highlights both the opportunities and challenges associated with their implementation. One of the most salient advantages of OER is their capacity to democratize access to high-quality educational resources, thereby enabling a wider range of learners to benefit from materials that were previously constrained by financial barriers or limited availability.

Progress in Metadata and Repository Development

The high adoption rates of metadata records and repositories indicate growing awareness among Malaysian universities regarding the need for robust resource organization and cataloging. Metadata facilitates seamless resource discovery and ensures that OER materials are accessible across various platforms and systems. Similarly, the widespread establishment of repositories underscores institutional efforts to

centralize OER resources and enhance their visibility and usability. Several studies (Henke et al., 2024; Ogunbodede & Cocodia, 2023; Tang & Tseng, 2023) further underscore the importance of library integration in OER ecosystems, arguing that libraries enhance the credibility, visibility, and sustainability of OER by implementing robust cataloging and preservation mechanisms. These developments are encouraging, as they align with global best practices for OER implementation and lay the groundwork for a scalable and interoperable OER ecosystem.

Challenges in Accessibility and Infrastructure

This study underscores the importance of implementing rigorous quality assurance frameworks to build trust in OER resources. Users, whether students, educators, or researchers, are more likely to adopt OER when they are assured of the quality and availability of materials. Institutions should invest in developing standardized evaluation criteria and regular review mechanisms to ensure that OER meets high academic and technical standards. By addressing disparities in accessibility, infrastructure, and licensing, institutions can create a more cohesive and sustainable OER ecosystem (McLure & Sinkinson, 2020; Petrides et al. 2018). These gaps suggest the need for targeted investments in digital infrastructure and the adoption of universal design principles to ensure equitable access for all users.

The Role of Libraries in Enhancing OER Integration

One of the most notable findings is the limited integration of OER platforms with academic libraries, with only 19% of the institutions demonstrating sufficient library involvement. This underutilization of libraries represents a missed opportunity to leverage their expertise in resource management, user support, and information literacy training. The low integration of OER with academic libraries (19%) reflects a lack of institutional policy alignment. Research indicates that OER sustainability improves when repositories are managed within library systems by strengthening this integration, which could bridge gaps in metadata curation and long-term preservation (Al-Zahrani, 2023; McGeary et al., 2021). Libraries are well-positioned to serve as central hubs for OER dissemination and curation, bridging the gap between resource availability and user engagement. Expanding library roles to include active participation in OER hosting and management could significantly enhance accessibility, streamline resource sharing, and promote a culture of openness.

Faculty Engagement and Ownership

The limited faculty engagement (25%) observed in this study highlights the need for greater effort to involve educators in OER initiatives. Faculty members are key drivers of OER adoption and sustainability as they are responsible for creating, adapting, and using

these resources in teaching and learning. Barriers such as lack of time, awareness, and training hinder their active participation. To address these challenges, institutions should implement structured faculty development programs that emphasize the benefits of OER, provide hands-on training in OER creation and adaptation, and offer incentives to encourage participation (Mishra et al., 2022; Santos-Hermosa et al., 2022; Wesolek et al., 2022). Collaborative platforms that simplify OER creation can also foster a sense of ownership and motivation among faculty members.

Implications for Policy and Practice

The findings of this study carry significant implications for both institutional and national policy development. At the institutional level, universities are required to prioritize accessibility, infrastructure enhancement, and the strategic integration of libraries in order to cultivate a more inclusive and functional OER ecosystem. At the national level, policymakers should consider implementing comprehensive frameworks that address gaps in licensing practices, accessibility standards, and faculty engagement. Incentives such as grants for OER development, the recognition of faculty contributions to OER, and support for infrastructure upgrades could accelerate the adoption and impact of OER in Malaysia. Moreover, the successful implementation of OER initiatives requires concerted efforts from all stakeholders, including policymakers, educators, and students. Establishing clear policies and frameworks can facilitate the creation and sharing of OER, thereby enhancing their visibility and usability.

**Building a Sustainable OER Ecosystem**

The discussion underscores the importance of adopting a holistic approach to OER implementation that addresses technical, institutional, and human factors. Sustained collaboration among stakeholders, including libraries, faculties, ICT departments, and policymakers, is essential to overcoming existing barriers and ensuring the long-term viability of OER initiatives (Ailakhu & Ibrahim, 2024; Carter & Santiago, 2023; Mićunović et al., 2023; Tang & Tseng, 2023). By addressing disparities in accessibility, infrastructure, licensing, and faculty engagement, Malaysian universities can create a more equitable and sustainable OER ecosystem that benefits educators and learners. Malaysia can strengthen its commitment to sustainable open education practices that align with global educational goals. Establishing a robust framework for OER can enhance access to quality educational resources and contribute to achieving broader societal objectives related to equity and inclusion in education. Figure 2 emphasizes three critical focus areas essential for ensuring the long-term sustainability and effectiveness of OER initiatives within Malaysian higher education institutions.

As a visual representation of the critical factors necessary for sustaining OER initiatives within Malaysian higher education institutions (HEIs), Figure 2 presents a

framework for achieving long-term OER sustainability, emphasizing the need for enhanced quality control, robust digital infrastructure, and institutional support for faculty involvement. Sustainability is a key concern in OER adoption, as institutions must ensure the long-term viability, accessibility, and sustained engagement of stakeholders. This figure provides a framework highlighting the essential components required to maintain and scale OER initiatives effectively on enhanced quality assurance, strengthening ICT infrastructure and promoting faculty Involvement to increased resource creation and utilization.

Figure 2

Sustainability of OER Initiatives in Malaysian Higher Education
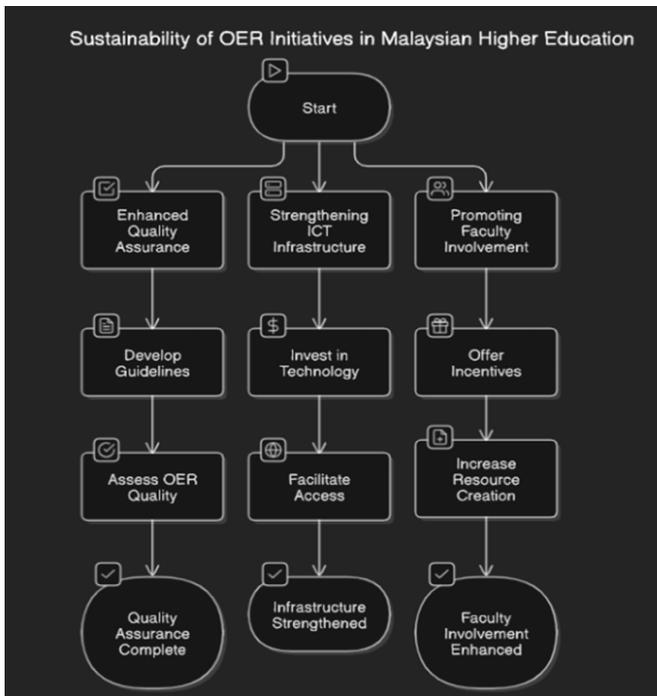
Global Relevance and Future Research

While this study focuses on Malaysian universities, its findings have broader relevance for other countries seeking to implement or enhance OER initiatives. The challenges identified in this study, such as accessibility gaps, low faculty engagement, and copyright concerns, are not unique to Malaysia and can inform global efforts to build more inclusive and effective OER ecosystems. Future research should explore the impact

of OER on student learning outcomes, faculty satisfaction, and institutional performance to provide a more comprehensive understanding of its benefits and challenges. The potential of OER to enhance educational access, reduce costs, and promote lifelong learning is well documented in international literature. However, Malaysian higher education institutions face unique challenges that slow the integration of these resources. These challenges include infrastructural limitations and varying levels of digital literacy between educators and students. Stakeholders, including the United Nations Educational, Scientific, and Cultural Organization (UNESCO), have emphasized the need for comprehensive guidelines and frameworks for OER development, and UNESCO has collaborated with the Malaysian Ministry of Higher Education to foster a more inclusive approach to OER.

Additionally, cross-regional comparisons could illuminate how different contexts influence OER adoption and implementation, thereby offering valuable lessons for policymakers and practitioners worldwide. The lessons learned from this study can also inform international efforts, particularly in regions facing similar policy, infrastructure, and engagement challenges. Through a collaborative and strategic approach, Malaysia's higher education institutions (HEIs) can realize the full potential of OER to transform education and foster equitable access to learning resources.

In summary, the findings highlight both the progress and the challenges associated with OER implementation in Malaysian universities. Although the high adoption rates of metadata records and repositories indicate promising developments, gaps in accessibility, infrastructure, library integration, and faculty engagement require urgent attention. By addressing these issues through strategic investments in technology, training, and policy alignment, institutions can unlock the full potential of OER. Fostering an inclusive and sustainable OER ecosystem will enhance educational access and equity and position Malaysia as a global leader in the open education movement.

LIMITATIONS

This study primarily focused on a comparative web analysis of 36 top Malaysian universities, specifically those listed in the QS Asia University Rankings. The analysis was conducted using a predefined set of checklists based on the OER standard criteria, including platform hosting, accessibility of search interfaces, availability of resource guides, alignment of subject resources or courses, existence of OER repositories, copyright and licensing policies, and OER metadata. The exclusive focus on Malaysian universities restricts the generalizability of the findings to other countries and geographical regions. Each country or region may have distinct approaches to implementing OERs influenced by different educational policies, technological infrastructure, and cultural contexts. This may result in an incomplete representation of OER practices in Malaysia, as smaller or less globally recognized institutions may employ

innovative OER strategies that are not examined in this study.

Moreover, the methodology focused exclusively on web-based content and documentation, thereby assuming that all relevant information on OER practices is publicly accessible online. These limitations suggest that, while this study provides a valuable snapshot of OER practices among Malaysia's top universities, further research involving broader institutional samples, cross-regional comparisons, and qualitative methods (e.g., interviews with OER practitioners) is necessary to build a more comprehensive understanding of OER implementation and its impacts.

CONCLUSION

This study highlights critical gaps in Malaysia's OER landscape, particularly in faculty engagement, accessibility compliance, and infrastructure readiness. While Malaysia has made strides in advancing OER, findings indicate persistent barriers, including limited institutional policies, insufficient faculty awareness, and inadequate technological infrastructure. These challenges underscore the need for a more coordinated and sustainable approach to OER implementation, moving beyond policy rhetoric to actionable strategies that drive meaningful adoption. One of the key contributions of this study is recognizing academic libraries as pivotal enablers of OER development. Libraries are not only repositories of knowledge but also active facilitators in copyright compliance, content curation, and faculty-librarian collaborations. However, their role needs further institutional support to maximize impact. Strengthening library-driven OER initiatives can enhance the accessibility and the quality of educational resources.

Additionally, this study emphasizes the importance of strategic policymaking and investment in digital infrastructure. OER adoption will remain fragmented without targeted interventions, such as open-licensing mandates, professional development programs, and incentives for faculty participation. A shift in perception is also necessary; OER should not be seen merely as a cost-saving measure but as a transformative force in democratising education and fostering innovation in teaching and learning. Future research would benefit from examining the longitudinal effects of OER on student learning outcomes, academic staff engagement, and broader institutional performance.

There is also a need for deeper investigations into the scalability of OER initiatives across diverse educational settings. A well-structured OER ecosystem in Malaysia can improve educational access and equity and serve as a model for regional adoption. Strengthening digital infrastructure, library integration, and faculty engagement will be pivotal in realizing the full transformative potential of open education. By addressing these research gaps and fostering a culture of collaboration, Malaysia can position itself as a leader in open education, aligning its efforts with the global Sustainable Development Goals and ensuring equitable access to knowledge for all.

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