

Digital Libraries and Sustainable Development Goals (SDGs): A Review Study with Case Studies from Academic Libraries

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Abstract

Digital libraries are now key elements of academic ecosystems through access to scholarly information, facilitating research, and inclusive education. As academic institutions move towards adopting the Sustainable Development Goals (SDGs) there is a growing expectation that they will ensure their digital infrastructure and knowledge services are aligned to global sustainability goals. The academic libraries, especially the digital library services, are well-positioned to add to this alignment. This is a review-based research paper that explores how digital libraries lead to the development of the specific SDGs, namely SDG 4 (Quality Education), SDG 10 (Reduced Inequalities), and SDG 13 (Climate Action). The research methodology will be based on a qualitative review of second-hand data synthesis of the information on the peer-reviewed literature, policy documents, and practices of the digital libraries of academic institutions. The review emphasizes the way in which the digital library services, including the open access platforms, institutional repositories, digital literacy practices, and green digital practices can help in equitable education, minimize the information inequality, and contribute indirectly towards environmental sustainability. To enhance practical usefulness, the paper introduces the cases of the exemplary digital library projects on the basis of which the SDG alignment in the academic setting can be observed in real-life. The results show that digital libraries perceive high-quality education and decreased inequalities, and digital interaction with climate action is being developed, but disproportionately across regions. Continuous problems include the existence of digital divides, infrastructural barriers, unified criteria of sustainability, and the insufficient understanding of SDG integration by library professionals. To sum up, the paper has highlighted the necessity of strategic planning, integration of policies, and collaborative frameworks to increase the role of digital libraries in sustainable development in higher education.

Keywords: Digital Libraries, Sustainable Development Goals (SDGs), Academic Libraries, Sustainability in Libraries, Quality Education (SDG 4), Library Services and SDGs

Introduction

The digital technologies have changed academic libraries greatly because technological progress has been rapid. Library operations and functions that were based on physical collections are being complemented by digital services in terms of electronic journals, e-books, institutional repositories, and online learning platforms. These services have helped in extending the reach of the academic libraries, allowing access to information all the time, regardless of time and place. Meanwhile, sustainability has become a worldwide focus, which redefined the demands of institutions

of higher learning. The SDGs are very inclusive as it deals with education, inequality, sustainability of the environment, and global relationships. The libraries, being the democratic institutions of knowledge, are naturally aligned to these objectives because they advance access to information, evidence-based learning, and social inclusion.

Digital libraries help to contribute to sustainable development by cutting down physical resource usage, facilitating distance learning, and providing open access to knowledge. The role of digital libraries in SDGs, however, despite the potential, is not always discussed in any organized or detailed way, at the service level. This inability to systematically document leads to the limitation of libraries in indicating their contribution to institutional sustainability reporting schemes.

The purpose of this paper is to fill this gap through the review of the literature and provide case studies that show how library digital services can be used to promote the particular SDGs in the academic context.

Literature Review

This review is a synthesis of literature about the topic of Digital Libraries and Sustainable Development Goals (SDGs) in Academic Libraries: Focus on specific SDGs (Quality Education, Reduced Inequalities, Climate Action) to fill knowledge gaps on the topic of how digital library initiatives can support the achievement of these objectives in academic settings. The review was expected to assess the incorporation of digital libraries with specific SDGs, benchmark services and policies, find out the implementation challenges, compare program effectiveness, and finally examine the importance of digital literacy and infrastructure. The systematic search and analysis of 50 multidisciplinary studies across various parts of the world were limited to qualitative and case study methods, as well as the bibliometric method. The results demonstrate a high level of conformity with quality education by means of digital literacy and open educational resources, and lower inequalities are mitigated by means of inclusive access to marginalized populations despite ongoing infrastructural and financial obstacles. Climate action initiatives showcase the emergent green library practices and climate literacy models, though there are geographical inequalities and a lack of sustainability integration. Outdated resources and a lack of training are an issue that limits technological infrastructure and digital literacy as essential enablers. The institutional collaboration promotes the sharing of resources and policy consistency, but it is usually not strategic. The overall findings highlight the multidimensional role of digital libraries in SDGs through the prism of systemic issues and lack of empirical support. The synthesis pinpoints the necessity of standardized assessment models, long-term investments, and strategic collaboration to maximize the place of academic libraries as drivers of sustainable development.

The study of the topic of digital libraries and Sustainable Development Goals (SDGs) in academic libraries has become a burning topic of research because of the growing focus on sustainable development and equitable access to information in the world. Since the implementation of the United Nations 2030 Agenda in 2015, academic libraries have developed to become active hubs of delivering good education, minimizing inequalities, and climate response (Shesha & Singh, 2024) (Dabengwa, 2024). Digital libraries especially have increased the availability of knowledge resources, and this has allowed people to continue learning throughout their lives and create educational settings that are inclusive (Mrs et al., 2019) (“Unlocking the power of digital libraries...”, 2023). The implementation of digital technologies in academic libraries fits SDG 4 (Quality Education), SDG 10 (Reduced Inequalities), and SDG 13 (Climate Action), which is aimed at addressing urgent social and environmental issues (Patil et al., 2025) (“Go Green, Embrace Sustainability: Empowe...”, 2025). The contribution of digital libraries to SDGs development is not only socially but also practically important to consider since more than 350,000 students in certain institutions use only the digital resources (Nhamo & Malan, 2021) (-, 2024).

In spite of this development, there remains a certain issue as to the degree and efficiency of the input of academic libraries to specific SDGs, especially in the digital setting. The current body of literature demonstrates partial evidence of how libraries actualize SDG-related practices, and there is little systematic

comparison of institutions (Dabengwa, 2024). The actual impact of digital library initiatives is controversial, and some of the studies note that these initiatives may lead to issues like digital divides, financial limitations, and lack of professional training (Shesha and Singh, 2024) (Agbetuyi and Olorunyomi, 2025) (Nirtha et al., 2025). On the contrary, other studies focus on effective types of digital inclusion and climate literacy initiatives (Maina et al., 2025) (Saini, 2024) (Ajani et al., 2024). The knowledge gap is in that there is no synthesis on the roles of digital libraries in the development of specific SDGs, quality education, reduced inequalities, and climate action, in the academic context (Hapsari et al., 2025) (Ramirez-Correa et al., 2025) (Velmurugan et al., 2025). This weakness does not promote the creation of strategic frameworks to enhance the sustainable development impact of libraries to the maximum (Islam et al., 2025) (Al-Metiry, 2025).

Theoretically, this review is based on the framework according to which digital libraries function as key enablers of sustainability literacy, as the knowledge and skills required to facilitate a sustainable future (Dabengwa, 2024) (Saini, 2024). This framework revolves around the digital access to education and environmental responsibility, and digital library services are connected to SDG realization (Ossiannilsson, 2023) (Naik, 2024). This theoretical contributes to the purpose of the research through the framework of digital libraries. As social integrators and custodians of the environment in the academic community (Liew, 2012) (Beasley, 2024).

This systematic review aims to critically analyse the role of digital libraries in academic institutions in the realization of SDG 4 (Quality Education), SDG 10 (Reduced Inequalities), and SDG 13 (Climate Action). It will give a synthesis of available knowledge and determine best practices and challenges, and offer strategic recommendations that can be taken to improve the role of digital libraries in sustainable development. The given review contributes to the field by filling the identified gap in knowledge by conducting a narrow, comparative study of the digital library projects in accordance with certain SDGs (Shesha and Singh, 2024) (Dabengwa, 2024) (Velmurugan et al., 2025).

The proposed study utilizes a systematic literature review technique that involves the inclusion and exclusion criteria to choose the applicable peer-reviewed articles published in 2019–2025. They are analytical frameworks that comprise of thematic synthesis and conceptual mapping to organize the results on the contributions made to the chosen SDGs of digital libraries. The review is designed in such a way that the roles of digital libraries in quality education, reduced inequalities, and climate action have been analyzed first to place the digital libraries within the SDG frameworks (Hapsari et al., 2025) (Dabengwa, 2024) (Islam et al., 2025).

Digital Libraries contribute to Quality Education (SDG 4)

Digital libraries are important contributors to quality education through offering equitable and inclusive access to academic materials, life-long learning, and distance and blended learning models. Research focuses on digital literacy initiatives and information literacy education and incorporation of open educational resources as a means to enhance educational performance and lessen access barriers (Shesha & Singh, 2024) (Mrs et al., 2019) (Silva et al., n.d.) (Ossiannilsson, 2023) (Dei and Asante, 2022) (Mambo, 2020). It is also mentioned that digital libraries play an essential role in benefiting marginalized communities, such as indigenous populations and students with disabilities, which is relevant to SDG 4 (Sahito et al., 2024) (Maina et al., 2025) (Arcinas, 2024).

Inclusive Digital Access (SDG 10)

Digital platforms are used by academic libraries to overcome socio-economic and geographic gaps by increasing information accessibility by underserved populations. Social inclusion (such as working with students with physical disabilities) and socially vulnerable groups is also a topic of investigation (Liew, 2012) (Sahito et al., 2024) (Maina et al., 2025) (Silva and Vlxio, n.d.). The literature observes the chronic digital divide and emphasizes the need to have sound policies, personnel development, and infrastructure investments to contribute to fair usage (Agbetuyi & Olorunyomi, 2025) (Nirtha et al., 2025) (Nhamo & Malan,

2021). Inclusive knowledge can also be achieved through collaborative work and metadata management and dissemination (Nel et al., 2024).

Climate Action and Environmental Sustainability Initiatives (SDG 13)

The environmental sustainability role as advocates and implementers of the academic libraries is anticipated in terms of green library programs, climate literacy programs, and green operational practices. Literature demonstrates the role of libraries in raising climate change awareness, creating green infrastructure, and content of services that educate about the environment (Patil et al., 2025) (“Go Green, Embrace Sustainability: Empowe...”, 2025) (Saini, 2024) (Naik, 2024) (Ajani et al., 2024) (Vijesh et al., 2024). The obstacles include financial limitations and the necessity to have standardized sustainability measures. Community involvement and strategic frameworks are suggested to increase the library contribution to environmental purposes (Hapsari et al., 2025) (Saini, 2024).

Digital literacy is found as one of the pillars that allow effective use of digital libraries in achieving SDG, including education of users and professional growth of the staff. The issues of limited technical capacity, lack of digital resources, and imbalanced digital capabilities among users and personnel are considered the problems of libraries to further the SDG-related results (Shesha et al., 2025) (Hapsari et al., 2025) (Nirdha et al., 2025) (Maina et al., 2025) (Islam et al., 2025). The investments in training, the adoption of new technologies (AI, big data), and the development of smart and sustainable library models are perceived as the keys to the further development.

The interaction between academic libraries, government agencies, academic institutions, and communities is important in ensuring that the SDG-related efforts are optimized. The policies are consistent with the national and international SDG agendas to aid in the sharing of resources, setting of standards, and raising of awareness (Shesha and Singh, 2024) (Mohamed and Abusharhah, 2024) (Dabengwa, 2024) (Missingham, 2024) (Lathifah et al., 2025).

There is also innovation in digital services and enhancement as a result of partnerships and outreach, which allows libraries to serve as knowledge nodes in sustainable development (Tabucanon, 2023) (Nel et al., 2024). It has been indicated that integrated strategies can strengthen the ability of libraries to play an important role in SDGs.

Obstacles and Problems of SDG Implementation in University Libraries. The challenges that are commonly mentioned are the lack of funding, inadequate infrastructure, the lack of awareness about the SDG integration among the professionals in the libraries, and the existence of digital divides. Research indicates that there is skepticism and the absence of sustainability literacy as barriers to complete involvement in SDG agenda (Shesha & Singh, 2024) (Hapsari et al., 2025) (Dabengwa, 2024) (Jarillo et al., 2019). Fragmented obstacles identified include collaboration, poor policy support, and technical competency shortage, particularly in resource-limited situations (Maina et al., 2025) (“The Role of the Library in Actualising U...”, 2022). It is important to counter these hindrances to boost the contribution of the libraries toward sustainable development. Open and distance education heavily rely on digital libraries to provide, which is crucial to having more access to education and lifelong learning, particularly where communities are remote or marginalized.

The literature records the compatibility of digital resources, e-learning platforms, and virtual services with SDG 4 through the provision of flexible and inclusive education (Mambo, 2020) (Mambo, 2021) (Akintolu and Adewoye, 2024). The issues of resource sufficiency, visibility, and professional personnel assistance are also still challenged, and further innovation and policy consideration are needed. Academic libraries can create programs and services that tend to foster social justice, mitigate inequalities, and aid marginalized populations. This will entail special attention to gender equality, LGBTQIA+ communities, and indigenous people, whereby library resources create inclusive spaces that are consistent with the corresponding SDGs (Shesha & Singh, 2024) (Dalmer and Griffin, 2023).

Objectives of the Study

The aims of this research are:

- To examine the current literature on digital libraries and Sustainable Development Goals in the academic world.
- To examine how digital library services contribute to SDG 4, SDG 10, and SDG 13.
- To explore some case studies involving the SDG-compliant digital library practices.
- To find issues and ways to improve sustainability-oriented services of digital libraries.

Research Methodology

The research methodology that is undertaken in this study is a qualitative review research based on secondary data. Peer-reviewed journal articles, conference papers, policy documents, and reports addressing digital libraries and sustainability will be utilized as sources of data. The data were analyzed through a thematic content analysis approach that highlighted repetitive ideas about SDG alignment, digital services, and sustainability practices.

Case studies were chosen based on the criteria of relevance, size, and representation of SDG-oriented digital library projects. The methodology is more of a descriptive synthesis and less statistical analysis, hence it is appropriate in conference presentations and discussion of the concept.

Mapping Digital Library to SDGs

The digital library services were mapped to the chosen SDGs to display the practical alignment. E-resources, repositories, open access platforms, and digital literacy initiatives are services that are very supportive of SDG 4. Open access and remote access services respond to SDG 10 because they decrease information inequality. Digital workflows and service delivery online have an indirect impact on SDG 13 in fostering environmentally friendly practices.

Case Studies

National Digital Library of India (NDLI)

National Digital Library of India (NDLI) is one of the largest national-level digital library efforts that are being made to facilitate inclusive and sustainable education in India. Started with the auspices of the Ministry of Education, Government of India, NDLI was envisioned to cope with inequality in accessibility to educational resources in different socio-economic, linguistic, and geographic layers of the population. The site integrates millions of digital learning content, such as textbooks, reference books, research papers, video lectures, theses, and competition examination material to serve learners at both the school level and higher education/lifelong study. NDLI has a direct impact on SDG 4 (Quality Education) through offering free and centralized access to quality academic resources, which enhances equitable, inclusive, and affordable education opportunities.

Sustainability-wise, NDLI is significant in minimizing educational disparities, especially for students in rural settings, poor economic backgrounds, and schools with minimal physical library facilities. The NDLI model of digital-first eliminates the traditional barriers of cost, location, and physical access to resources, which makes it very close to SDG 10 (Reduced Inequalities). The presence of multilingual content also promotes inclusivity in that language barriers that in most cases restrict access to good educational materials are countered in a linguistically diverse nation such as India. Besides, NDLI helps learners with diverse needs to learn by providing different formats of content (text, audio, and video) and thus, to enhance access to learning, which is more personalized and learner-focused.

Besides social, NDLI has a secondary effect on environmental sustainability as it reduces the reliance on printed textbooks as well as physical library infrastructure. Massive digital distribution of resources lowers the amounts of paper used, printing, carbon emissions through transportation, and so forth, making the

initiative consistent with responsible consumption and sustainable knowledge activity. NDLI also promotes academic libraries through supplementing institutional collections, overcoming redundancy of physical resources and allows libraries to redirect their efforts towards user support, digital literacy and research support. In general, NDLI is a powerful illustration of how a national digital library project can realize the sustainability objectives in terms of scalable, technology-based knowledge access and enhance the position of libraries as agents of inclusive development.

Open Access Repository arXiv. arXiv is one of the largest open access digital repositories in the academic communication system across the world. arXiv, founded and sponsored by Cornell University offers preprints free of charge in physics, mathematics, computer science, quantitative biology and other related fields. By enabling researchers to publish their works quickly and cost-free, the arXiv contributes to the research infrastructure all over the world to a great extent, directly impacting SDG 9 (Industry, Innovation and Infrastructure). By facilitating the early dissemination of research products, providing a fast-tracked scientific discourse, and enhancing innovation, the platform will enable researchers all over the world to build up on the new knowledge without the delays that would otherwise be encountered in a normal publishing process.

The open access paradigm at arXiv is critical in minimizing disparities in scholarly communication, specifically, among researchers and institutions in developing and resource-constrained areas. High costs of subscription-based journals may reduce access to the latest research, which creates an unequal situation between better-endowed institutions and those with low budgets, which arXiv overcomes by offering unrestricted access to scholarly content, supporting SDG 10 (Reduced Inequalities). Scholars, learners and teachers worldwide are able to read state-of-the-art research regardless of institutional membership or expense and allow more democratic and inclusive research climate.

Moreover, arXiv helps to achieve SDG 17 (Partnerships for the Goals) as it allows research to be conducted internationally. The platform serves as the knowledge repository across the globe which makes it possible to exchange ideas across borders and provide collaborative networks amongst the researchers. Its digital preservation practices are also long-term, which makes it sustainable in terms of its scholarly knowledge since the outputs of the research are protected against destruction by future generations. arXiv also promotes environmentally friendly research because research papers do not need to be distributed physically, thus minimizing the use of paper and other environmental expenses. Using arXiv as an example, an open-access digital repository can enhance the scholarly communication process to a fairer, more innovative, and more sustainable model that meets the global goals of development.

Institutional Repository (IR) Academic Library. IRs run by academic libraries are a key digital infrastructure to preserve, publish and present the intellectual output of universities and research institutions. These archives are commonly made up of theses, dissertations, faculty publications, conference papers, research datasets, and institutional documents. Institutional repositories can be seen as a strong contributor to SDG 4 (Quality Education) by providing greater access to local knowledge and learning material via high levels of long-term and open access to scholarly work. An example is Shodhganga, which is operated by INFLIBNET and which offers open access to theses for doctoral degrees submitted to Indian universities. This site helps students and researchers to refer back to previous studies, prevent duplication of research, and enhance the quality of scholarly inquiry. In the same way, the teaching and learning process is supported by repositories like DSpace@MIT, which offer free access to research conducted by the faculty, information about courses, as well as theses by the students, thus strengthening the learning based on evidence and continuity of academic programs.

The institutional repositories equally play a significant role in SDG 9 (Industry, Innovation and Infrastructure) in enhancing the research visibility and institutional research capacity. Enabling easy access to the results of research, repositories enhance the potential of citation, encourage innovation and the sharing of knowledge between the academic community and industry. As a case example, Harvard DASH (Digital

Access to Scholarship at Harvard) improves the discoverability of the research output of the university on a global scale, allowing industry professionals, policymakers, and entrepreneurs to access state-of-the-art research without the help of subscriptions. Most repositories are based on international interoperability guidelines like OAI-PMH, making them harvested by metadata harvesting platforms such as Google Scholar and OpenAIRE. Such integration promotes the visibility of global research, especially in institutions in developing countries where the scholarly results usually do not have sufficient representation on the commercial indexing databases.

Institutional repositories are important as far as SDG 17 (Partnerships for the Goals) is concerned because they facilitate collaboration and sharing of knowledge across institutions and national borders. Transparency of institutional research enables the interaction of the researchers, financial institutions, policymakers, and civil society groups. As an example, in the European continent, university repositories are part of global networks like OpenAIRE or national consortia frameworks that promote cross-institutional research collaboration and sharing of data. Another application of repositories is in the support of collaborative research project as datasets and reports can be reused by research groups abroad, thus enhancing partnerships to achieve sustainable development goals.

The institutional repositories also promote sustainability by the fact that they contribute to environmentally friendly scholarly communication practices. Repositories contribute to minimizing physical storage demands and reducing paper usage through the promotion of the digital preservation of materials and decreasing the use of printed theses, reports, and journals. This goes in line with the greater sustainability goals in regard to responsible resource utilization. Moreover, institutional repositories can help academic libraries to regain a focal position in academic publishing by limiting reliance on complex and costly commercial patterns of publication. Nevertheless, the institutional repositories continue to serve as a potent and viable model of how academic libraries may drive their sustainability objectives by means of digital knowledge management, open access promotion, and international cooperation despite the currently existing challenges, including low levels of faculty awareness, policy voids that are linked to the necessity of making deposits, and resource limitations.

Table 1 Case Study Summary Table

Case Study	Digital Library Type	Key SDGs Addressed	Major Contributions	Sustainability Dimension
National Digital Library of India (NDLI)	National digital library platform	SDG 4, SDG 10	Inclusive access to educational resources; multilingual content	Social & educational sustainability
arXiv Open Access Repository	Global open access repository	SDG 9, SDG 10, SDG 17	Open scholarly communication; research collaboration	Research & innovation sustainability
Institutional Repositories	University-based digital repositories	SDG 4, SDG 9, SDG 17	Preservation and dissemination of institutional research	Knowledge & infrastructural sustainability

As shown in Table 1, the summary table of the case study shows how the varied digital library models contribute to the promotion of sustainability by adhering to certain goals of sustainable development (SDGs). The National Digital Library of India (NDLI) can serve as a platform of a national digital library that fulfills SDG 4 (Quality Education) and SDG 10 (Reduced Inequalities) through providing inclusive, multilingual, and equitable access to educational content, which can help to make society and education sustainable. Conversely, the arXiv open access repository is globally based, and it contributes to SDG 9 (Industry,

Innovation and Infrastructure), SDG 10, and SDG 17 (Partnerships for the Goals) by establishing open scholarly communication, research collaboration, and the dissemination of scientific knowledge quickly, which enhances the sustainability of research and innovations. Institutional repositories, which are often run by universities, respond to SDG 4, SDG 9, and SDG 17 by ensuring the systematic storage and sharing of institutional research outputs, which improves access to knowledge in the long term, increases academic visibility, and sustainability in higher education institutions.

Discussion

The literature review and the chosen case studies make it evident that digital libraries are now relevant facilitators of sustainable development in academic settings. Their most effective and consistent input is their contribution to SDG 4 (Quality Education), which implies access to scholarly resources in a continuous, equitable, and affordable manner. Digital libraries increase learning opportunities beyond physical campuses, facilitate blended learning, distance education, and lifelong learning. These activities include national and institutional repositories, open access repositories, and national digital libraries, and they all demonstrate how digital tools reduce reliance on traditional print-based systems and democratize access to educational materials.

One of the key discoveries of the review is that inclusion and equity are one of the major themes of the digital library initiatives. Digital libraries facilitate SDG 10 (Reduced Inequalities) by eliminating cost barriers and other geographical constraints and physical access limitations. According to the case studies, the open access models and central digital platforms are especially useful in resolving the imbalances between the institutions having varying financial and infrastructural capabilities. Nevertheless, this level of influence differs markedly in different areas and institutions, which indicates that it is only necessary to have access, but to use it effectively, it is important to be digitally literate, technologically prepared, and user-aware.

It is also shown in the discussion the role of digital libraries in enhancing research infrastructure and innovation ecosystems, especially open repositories and institutional research platforms. These services will increase the research visibility and foster interdisciplinary cooperation as well as exchange knowledge globally, which is consistent with SDG 9 (Industry, Innovation and Infrastructure) and SDG 17 (Partnerships for the Goals). Digital repositories do not only save the institutional knowledge; they also make the academic libraries an active participant in the scholarly communication, but not a manager of the content.

Though the above is positive, the review shows that the issue of climate action and environmental sustainability is under-researched in digital library discourse and practice. Although digital libraries can play an implicit role and achieve SDG 13 (Climate Action) by cutting down on the use of paper and decreasing the need for physical infrastructure, climate-specific initiatives are less frequent. The literature proposes that the sustainability activities in libraries tend to be operational-driven instead of being incorporated strategically in the arrangements of digital services. It means that libraries have to go beyond the unintentional environmental benefits and assume more proactive climate literacy and sustainability advocacy.

The second valuable learning point from the discussion is the asymmetrical implementation of SDGs in the library policies and strategy. Although most libraries undertake activities related to SDGs, they tend to be ad-hoc, informal, or individualistic in nature and not guided by institutional requirements. Such inconsistency makes library contributions to sustainable development less visible and measurable. The lack of standardized assessment frameworks also makes it harder to assess impact, and some studies refer to this practice as SDG washing because contributions are purported to exist.

In general, the discussion indicates that digital libraries have high potential that can trigger sustainability in higher education. Nevertheless, this potential can be achieved only with the help of coordinated institutional assistance, policy alignment, and systematic assessment. Digital libraries do not just influence the attainment of SDGs because of technology but also because of governance and leadership, as well as professional capacity in academic institutions.

Challenges and Future Scope

Although the role of digital libraries in sustainable development has been proven, there are still a number of challenges that curtail their potential. The digital divide is one of the most important issues that has been recognized in the literature. The unequal access to internet connectivity, access to internet devices, and technological facilities still limits the equal use of internet-based digital library services, especially within the developing regions and rural areas. The inconsistent access defeats the objective of inclusive education and knowledge equity even in environments in which digital platforms are accessible.

The other significant problem is that there is a lack of sustainability literacy between library professionals and users. A number of librarians have an idea of SDGs but do not have a hands-on recommendation on how to incorporate these objectives into the planning and assessment of digital services. Equally, users might be unaware of the contribution of digital libraries towards the realization of sustainable development, and will decrease their activities on SDG-oriented resources and programs. This is where the gap is evident, and it shows that specific capacity-building programs and professional development that focus on sustainability are required.

Lack of standardized measures and assessment systems is also a great challenge. Although digital libraries do many SDG-aligned activities, there is not much uniformity in measuring and reporting these activities. Libraries cannot easily show impact in institutional sustainability reporting or national evaluation systems without indicators, which are clear. The absence of evidence-based analysis undermines advocacy and restricts the potential of strategic funding and partnership.

Disjointed teamwork also limits development. In spite of the fact that partnerships are viewed as critical to SDG realization, collaboration between libraries, academic units, government bodies, and external stakeholders is informal or temporary. Lack of an institutionalized model of partnership lowers the scalability and sustainability of online library programs.

In perspective, future studies and practice ought to be aimed at the creation of impact assessment frameworks to associate digital library services with particular SDG goals. Strong empirical evidence would be offered by longitudinal studies on the effect of increased or decreased access, learning outcomes, and research visibility over time. Digital libraries have a greater potential to enhance their sustainability as a policy-driven strategy that includes SDGs in library strategic plans, accreditation systems, and national education policies. The opportunities for future service delivery that is in alignment with SDGs are also provided by emerging technologies, including data analytics, artificial intelligence, and smart library systems.

Conclusion

This is a review-based study that explored how digital libraries can promote the desired Sustainable Development Goals in the academic setting, specifically quality education, lessening inequalities, innovation, collaborations, and emerging climate action programs. The results validate the fact that digital libraries are no longer support units that are located at the periphery but as central players in institutional sustainability endeavours. Academic libraries provide an important contribution to knowledge equity, research sharing, and access to inclusive learning through open access platforms, national digital project initiatives, institutional repositories, and more.

As the case studies show, digital libraries can be used to meet SDG 4 (Quality Education) because it facilitates accessible (low-cost), flexible, and inclusive access to educational materials. They are also very important in SDG 10 (Reduced Inequalities), where financial, geographic, and institutional barriers to information are minimized. The open scholarly communication platform and repositories enhance the research infrastructure and international collaboration, which are in line with SDG 9 and SDG 17. Although the contributions to SDG 13 (Climate Action) are more indirect at the moment, digital libraries, however, foster environmentally responsible behaviour through minimizing the use of physical materials and facilitating sustainable distribution of knowledge.

The study, however, also points to the fact that the sustainability of the digital libraries' effect on sustainable development is not evenly distributed and depends on the institutional preparedness, policy backing, and professional abilities. Digital divides, poor sustainability awareness, and the absence of standard evaluation tools are some of the challenges that still limit the visibility and scalability of SDG-related library efforts.

To sum up, digital libraries have a lot of potential to become an important strategic sustainability partner in institutions of higher learning. An improved policy alignment, the creation of measurable impact structures, and long-term partnerships can go a long way in improving their contribution to sustainable development. With higher education still facing the digital transformation, academic libraries should reflect on sustainability to form a fundamental aspect of their digital services, whereby the retrieval and maintenance of knowledge can serve as a proactive contributor to the development of the world at large.

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