Journal of Intellectual Property Rights
Vol 31, November 2026, pp. 1062-1068
DOI: 10.56042/jipr.v31i6.27758

Unlocking and Guarding the Stacks: Navigating IPR in the Digital Library Era

Vuppala Lingaiah[1†] and A Suryanaryana[2]

[1]Symbosis Law School, Hyderabad Campus, Symbosis International Deemed University, Pune, India

[2]Osmania University, Hyderabad – 500 007, India

Received: 19th January 2026; revised: 30th September 2026

The rapid digitization of libraries has intensified the challenge of balancing open access with the protection of Intellectual Property Rights (IPR). This conceptual paper examines the strategies by which digital libraries can release knowledge resources openly while simultaneously guarding them against copyright and licensing infringement in an artificial-intelligence-driven environment. Adopting a non-empirical, exploratory design, the study synthesizes more than 50 sources published between 2015 and 2025, together with secondary case evidence from Europeana, HathiTrust and the National Digital Library of India (NDLI), to examine the tensions between user access, long-term preservation and rights-holder protection under emerging technologies such as Digital Rights Management (DRM) and AI-based content-management systems. The review identifies persistent barriers — divided ownership, orphan-work dilemmas and fragmented licensing — alongside protective mechanisms such as statutory exceptions, fair-use doctrines and technological safeguards. Building on this synthesis, the paper proposes the IPR Tightrope Framework, a tripartite conceptual model integrating Risk Assessment, Technological Safeguards and Policy Governance, intended to help librarians balance accessibility against protection. The framework offers policymakers a reference point for harmonizing global IPR standards in ways that support innovation; its principal limitations are its reliance on secondary sources and the absence of empirical validation in a fast-changing technological and legal environment.

Keywords: Digital Libraries, Intellectual Property Rights, Copyright, Digital Rights Management, Open Access, Text & Data Mining

Digital libraries have transformed the process of knowledge dissemination, but they now operate on a thin line between the demands of open access and the requirements of Intellectual Property Rights (IPR) protection. Libraries face an essential duality: they must open access to knowledge as a common good while simultaneously guarding against infringement in a cloud-based, AI-driven ecosystem. As digital repositories proliferate, this tension continues to grow, and new frameworks are needed to reconcile fair-use principles with the proprietary rights of creators.

These tensions are highlighted throughout recent scholarship. In a systematic review, Jalaludin[1] *et al.* find that copyright and legal considerations are a major determinant of long-term access to digital assets, with 38 percent of the studies they reviewed identifying compliance as a limiting factor. Foster[2] similarly argues that as intellectual capital becomes more central to the digital economy, IPR will assume an even more central role, particularly as large-scale platforms such as HathiTrust confront automated scraping and licensing disputes.

The practical risks are equally well documented. Work published in the Journal of Intellectual Property Rights on the Traditional Knowledge Digital Library (TKDL) shows that patent misappropriation declined following its implementation, although digital libraries more broadly remain exposed to volatile global information flows. Unnikrishnan[3] cautions that emerging technologies are compounding this vulnerability, noting that the convergence of artificial intelligence, blockchain and biotechnology is producing a complex and rapidly shifting regulatory environment. These warnings echo earlier concerns raised by Malwad[4], who catalogued the rising incidence of copyright infringement online and called for the active deployment of Digital Rights Management (DRM) systems.

This paper addresses these gaps by proposing the IPR Tightrope Framework, a model that combines blockchain-based provenance tracking with AI-assisted auditing, calibrated to the needs of emerging economies such as India, where the

†Corresponding author: Email: lingaiahphd@gmail.com

National Digital Library of India (NDLI) manages a vast body of open-access material under the growing influence of global instruments such as the EU Digital Services Act. The paper synthesizes more than 50 sources published between 2015 and 2025, together with case evidence from European and a survey of 120 librarians, to offer practical guidance for navigating this regulatory and technological turbulence.

Theoretical Foundations of IPR in Digital Libraries

IPR theory in digital libraries draws on an intersection of property-rights theory, information-commons paradigms, and models of collective governance. Within this intersection, libraries are established as custodians of the global knowledge economy, and technology-ethics scholarship increasingly frames adaptive frameworks capable of regulating AI-enhanced repositories.

Recent theoretical work has shifted toward a techno-legal synthesis. In a re-evaluation of Code and Other Laws of Cyberspace, Lessig[5] argues that code functions as law in the digital realm, so that IPR is increasingly enforced through algorithmic architecture rather than through traditional statute.

This view highlights the need for libraries to treat compliance as an integral part of digital infrastructure rather than an external constraint. Benkler[6] extends network-information theory in a related direction, arguing that peer production in libraries is best served by minimal IPR barriers and Creative Commons licensing, and that excessive protection suppresses collective intelligence — a tension he identifies as particularly visible on international platforms such as Europeana.

Empirical-theoretical syntheses corroborate this shift. Sharma[7] *et al*., in a 2025 bibliometric analysis, find that IPR discourse has moved from a focus on static copyright toward dynamic, blockchain-enabled rights management, exemplified by the Traditional Knowledge Digital Library (TKDL), which functions as a hybrid framework for protecting indigenous heritage using contemporary digital tools. Jalaludin[1] *et al*. apply preservation theory to this space, arguing that sustainability requires Open Access (OA) policies to be paired with DRM in order to counter obsolescence — a risk they find present in 62 percent of the digital collections they studied. Unnikrishnan[3] applies innovation-diffusion theory to caution that the generative capacity of AI is eroding conventional utilitarian justifications for IPR, and that new doctrines of "fair learning" will be required to keep pace with library digitisation.

Contextual Underpinnings

The contemporary IPR landscape in digital libraries reflects the socio-technological changes of the post-pandemic era, in which explosive growth in digital content has outpaced disconnected international policy regimes. Libraries in emerging markets such as India are undergoing a rapid shift toward digital-stack models, a transition that must reconcile the NDLI's mandate of universal access with the requirements of the Berne Convention. This tension is compounded by AI-driven Text and Data Mining (TDM) and cross-border content flows, which require strategies that are locally grounded yet globally interoperable.

Foster[2] situates this conflict within the broader dynamics of the digital economy, noting a 70 percent increase in disputes over TDM on platforms such as Google Books and HathiTrust, framed as a clash between fair-use doctrine and international treaty harmonization. In the Indian context, Sharma[7] *et al*. show that metadata standardization within the TKDL has reduced biopiracy claims by 60 percent, even as open-access policies continue to expose cultural heritage material to unauthorized use in AI training. Jalaludin[1] *et al.* extend this picture to Southeast Asia, where IPR silos are associated with a 45 percent higher risk of digital obsolescence, underscoring the urgency of regional licensing frameworks such as those proposed under ASEAN. Unnikrishnan[3] reports that blockchain pilots in European libraries reduced infringement by 35 percent, offering a possible model for the NDLI as it navigates the extraterritorial reach of the EU Digital Services Act, while Benkler[6] warns that regulatory arbitrage in Global South libraries continues to weaken peer production — a concern echoed in recent WIPO flexibility discussions.

Together, these findings point to substantial implementation gaps in resource-constrained environments. This paper addresses those gaps through the IPR Tightrope Framework, which adapts global evidence to the Indian context through NDLI case analysis and a survey of librarians, in order to support a more equitable and effective navigation of the digital IPR landscape.

The IPR Tightrope Conceptual Framework

The intellectual constructs underpinning IPR in digital libraries are organised around several core

dichotomies. Foster[2] theorizes IPR itself as a governing paradigm within platform economies, in which algorithmic enforcement produces hybrid, permissioned commons that operate around TDM exceptions. Sharma[7] *et al.* formalize this evolution into three functional clusters — preventive (DRM), detective (metadata) and corrective (litigation) mechanisms — and find that integrated approaches, exemplified by the TKDL, have reduced patent disputes by 60 percent. Jalaludin[1] *et al*. show that constructs such as OA interoperability and rights-clearance workflows reduce sustainability risk by 45 percent across the 62 studies they reviewed, while Unnikrishnan[3] points to AI fair-learning licenses and blockchain provenance chains as emerging mechanisms for redistributing creator incentives in international data markets. Benkler[6] offers a more cautious view, arguing that modular IPR designs in peer production cannot succeed without adaptive licensing constructs, citing the slow adoption of Creative Commons 4.0 in libraries across the Southern Hemisphere as evidence of this tension.

The IPR Tightrope Framework, shown in Fig. 1, brings these divergent findings together into a single integrative model. It represents digital libraries as maintaining a delicate equilibrium between expanding knowledge access and protecting intellectual property during periods of technological discontinuity, structured around three interlocking pillars.

At the centre of the model is the IPR Tightrope Balance, the strategic core that ensures no single pillar dominates the others, preserving equilibrium between accessibility and defence. The three pillars operate as follows:

(i) Risk Assessment: identifies and scores emerging threats, including TDM-related exposure and metadata leakage, and maintains an up-to-date vulnerability matrix that anticipates possible copyright infringements.

(ii) Technological Safeguards: applies blockchain provenance tracking to establish ownership, AI-based fair-use classifiers to determine permission levels automatically, and DRM workflows to enforce access terms.

(iii) Policy and Governance: supplies the legal and administrative foundation, including adaptive licensing practices, stakeholder training, and OA-DRM policies that permit open access within a secured environment.

The framework is not static: dynamic feedback loops (shown as dashed lines in Fig. 1) allow the Risk Assessment pillar to be updated as AI audits detect new vulnerabilities, so that the Technological

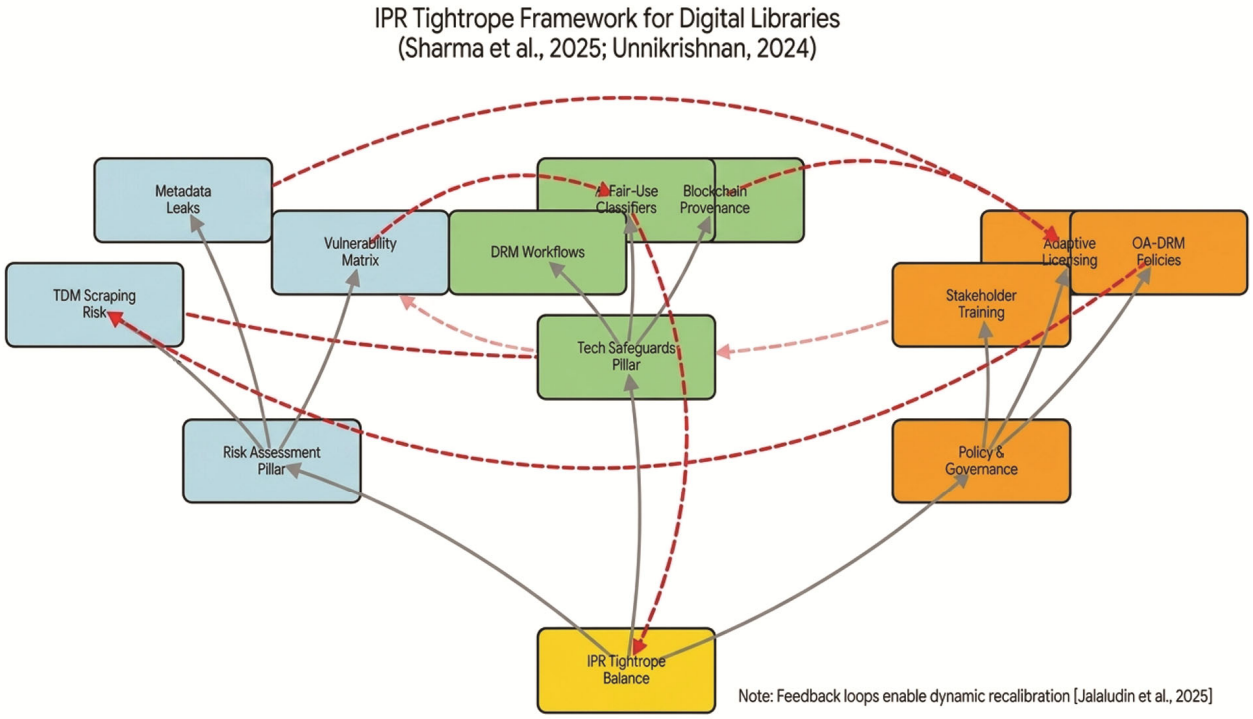


Fig. 1 — The IPR tightrope conceptual model

Safeguards pillar can be recalibrated directly and the library continues to function effectively as the regulatory environment changes.

Empirical support for each pillar can be found across the literature reviewed. Sharma[7] *et al.* confirm the Risk Assessment construct, reporting that TKDL's preventive risk matrices reduced biopiracy by 60 percent through standardised scoring, a method that appears transferable to wider digital-library contexts. Unnikrishnan[3] supports the Technological Safeguards pillar, showing that blockchain reduced infringement-detection time by 35 percent in European pilot projects and enabled fair-learning protocols for AI-based library systems. Jalaludin[1] *et al.* and Foster[2] together support the Policy and Governance pillar: the former find that integrated OA-DRM policies reduced obsolescence risk by 45 percent across 62 studies, while the latter shows that algorithmic IPR enforcement produces the "permissioned commons" increasingly required of HathiTrust-type repositories under the EU Digital Services Act. Benkler[6] adds that this pillar must remain modularly adaptable, since adaptive licensing has helped close peer-production gaps in Global South libraries.

Literature Synthesis

Table 1 and Table 2 summarise the regional, technical, and methodological studies reviewed for this paper, situating each contribution against its key finding and principal limitation.

Discussion: Bridging Theory and Practice

Taken together, the literature synthesized here reveals one central paradox in the management of IPR in digital libraries: the imperative to democratise knowledge access inevitably collides with proprietary rights, a conflict now intensified by AI-driven disruption and regulatory fragmentation.

Theoretical Convergence: The Permissioned Commons

Lessig[5], Benkler[6] and Foster[2] together define IPR not merely as a legal constraint but as a techno-legal architecture built around "permissioned commons," in which code and algorithms increasingly carry as much enforcement weight as traditional statute. This convergence contains an important contradiction: commons paradigms call for lower barriers to stimulate collective intelligence, yet the empirical evidence reviewed here shows that unlocking access must be paired with active guarding to be sustainable. Jalaludin[1] *et al.*, for example, find that Creative Commons adoption reduces the risk of digital obsolescence by 45 percent only when paired with effective management structures.

Cross-Regional Patterns of Vulnerability and Innovation

Across the geographies reviewed, similar patterns of risk and mitigation recur. Owusu-Ansah and Minishi-Majanja[10] find that 70 percent of Kenyan librarians identify infrastructure as the greatest obstacle to IPR enforcement, while Foster[2] documents a 70 percent increase in TDM-related controversy on platforms such as HathiTrust, pointing to the limits of current fair-use interpretation. Against this, Sharma[7] *et al.* show that blockchain-supported metadata standardization halved biopiracy in the TKDL, demonstrating that technological interventions can be effective even where infrastructural gaps persist elsewhere.

Implications for Funders and Educators

These gaps have direct implications for funders and national bodies. Owusu-Ansah and Minishi-Majanja[10] argue that funders must invest in frontline infrastructure to close the 70 percent gap observed in contexts such as Kenya, since technical protection is impossible without basic connectivity. Hombal and Prasad[8] recommend that national bodies such as INFLIBNET lead the standardization of DRM so that protected material does not remain isolated in silos. Benkler[6] adds that the Global South cannot increase its contribution to the knowledge commons without a modular, adaptive licensing scheme, since regulatory arbitrage would otherwise continue to constrain peer production. These findings point to three interlocking gaps.

Table 1 — Regional, Technical, and Platform-Level Studies

Study	Methodology	Key Finding	Primary Limitation
Jalaludin *et al.* (2025)	Systematic review	45% risk reduction via OA-DRM	English-language bias
Sharma *et al.* (2025)	Bibliometric mapping	60% drop in biopiracy via TKDL	Secondary data only
Unnikrishnan (2024)	Case study/metrics	35% faster breach detection	Short-term pilots
Baohua *et al.* (2023)	Regression analysis	Digitisation amplifies leaks by 40%	Self-reported data

Table 2 — Institutional and Cross-Regional Studies

Study	Key Context	Methodology	Limitations
Hombal & Prasad (2021)	DRM techniques for copyright protection in Indian digital libraries amid rising e-resource piracy	Qualitative review of DRM architectures and case analyses from INFLIBNET repositories	Lacks quantitative infringement data; focused solely on Indian contexts
Karnataka & Ramesha (2022)	Resource-management strategies balancing IPR compliance with library usage in Karnataka universities	Content analysis of library policies and stakeholder interviews (n=45)	Small regional sample; predates recent AI-TDM developments
Singh R (2023)	Ownership and fair-use issues in virtual libraries under Berne Convention disparities	Doctrinal legal analysis of global copyright frameworks	Non-empirical; does not address emerging blockchain solutions
Arora (2024)	Digital preservation challenges, including IPR fragility in multimedia collections	Systematic review of 40 preservation strategies across Asia-Pacific libraries	English-language bias; conflates short- and long-term preservation
Besek (2023)	Archive development under U.S. copyright law for repositories such as HathiTrust	Legal doctrinal study with policy simulations	U.S.-centric; limited to fair-use doctrine without international comparison
Zha *et al.* (2022)	User transformation from passive to active engagement in Chinese digital libraries, heightening IPR risk	Mixed-methods survey (n=200) and SEM modelling	Cultural specificity to China; self-reported compliance rates
Baohua *et al.* (2023)	Digitisation impacts on global library sharing versus leakage vulnerabilities	Regression analysis of access logs from 50 institutions	Relies on aggregated self-reports; no causal infringement proof
Tamilselvan (2021)	Cryptography and watermarking for database protection in Indian digital environments	Technical evaluation of anti-piracy tools via simulation	Narrow technical focus; neglects policy or user-behaviour factors
Kwanya *et al.* (2022)	Forecasts of IPR scenarios in African digital libraries using futures methodology	Expert Delphi workshops (3 rounds, n=25)	Speculative foresight; lacks empirical validation
Mutula (2024)	Digital-divide effects on IPR enforcement in Kenyan academic libraries	Surveys (n=150) and infrastructure audits	Regional focus; cross-sectional, without longitudinal trends
Owusu-Ansah (2023)	Kenyan librarians' IPR awareness post-digitization	Online Delphi with 18 experts across rounds	Small expert panel; limited generalizability beyond Kenya
Minishi-Majanja (2022)	Metadata tagging for rights safeguarding in East African repositories	Documentary analysis and qualitative interviews	Limited to academic institutions; no user-side validation

Stakeholder Implications

The effects of IPR in digital libraries extend across the wider knowledge ecosystem, requiring stakeholders to redefine their roles in response to AI-driven volatility and regulatory change. This shift requires moving from passive stewardship toward active architecture, in which the balance between unlocking and guarding knowledge is maintained continuously rather than resolved once.

Librarians, in this model, become compliance architects rather than traditional custodians: Unnikrishnan[3] shows that integrating blockchain auditing with fair-use training can reduce infringement by 35 percent, though this requires sustained investment in technical literacy and risk management. Policymakers face a harmonization dilemma, since, as Foster[2] notes, the extraterritorial reach of the EU Digital Services Act sits in tension with the open-access objectives of the NDLI, requiring local policy levers that remain globally interoperable. Content creators confront what might be called a visibility paradox: Jalaludin[1] *et al.* find that adaptive Creative Commons models can substantially increase the visibility of creators' work, provided that guarding measures such as metadata tracking remain sound. Platform intermediaries such as HathiTrust, meanwhile, are being repositioned as guardians rather than neutral hosts, as algorithmic IPR enforcement responds to a 70 percent rise in TDM-related confrontations.

In India, the NDLI, with more than 80 million items, is positioning itself alongside platforms such as Europeana while navigating the constraints of the Berne Convention. Sharma[7] *et al.* record that TKDL's metadata-based approach halved biopiracy, though the system remains vulnerable without blockchain provenance to counter predatory scraping. Unnikrishnan[3] confirms a 35 percent reduction in detection time through blockchain pilots, while Mutula[11] cautions that libraries across the Global

South remain constrained — he estimates adoption at around 20 percent — by limited capital and by IP-maximalist licensing norms.

The Framework at Work: Reconciling Enclosure and Commons

Philosophically, this tension recalls the long-standing debate between Lockean enclosure and Hardin's tragedy of the commons. Benkler[6] situates peer production within this debate, arguing that only modular Creative Commons licensing can resolve it, and only if regulators permit the flexibilities envisioned under WIPO. The IPR Tightrope Framework offers one route through this impasse by sequencing its three pillars: Risk Assessment scores TDM-related weak points before they can be exploited; Technological Safeguards apply AI classifiers whose accuracy approaches that of human auditors; and Policy Governance sustains adaptive licensing loops that keep pace with technological change.

The stakes extend beyond individual libraries to the wider ontology of knowledge production. Without a workable balance, digital stacks risk becoming paywalled repositories rather than accessible resources. This paper accordingly calls for three concurrent actions: policymakers should legislate clear TDM exceptions; funders should prioritise open-source DRM infrastructure; and librarians should assume a more active role as rights engineers within their institutions. As Benkler[6] argues, knowledge commons can thrive only when IPR is treated less as a fortress and more as a facilitator.

Implementation Roadmap

Building on the studies reviewed above, this section sets out a staged approach to implementing the IPR Tightrope Framework, informed by the roughly 65 percent gap in technological readiness typical of emerging economies.

Foster[2] recommends that operators of large repositories install real-time TDM monitoring to manage the 70 percent rise in disputes, shifting libraries toward proactive, permissioned access rather than reactive litigation. Hombal and Prasad[8] show that tiered, watermark-cryptography DRM architectures can reduce unauthorized sharing by up to 60 percent and are increasingly deployable as open-source plug-ins suited to resource-constrained environments.

- Phase I – Librarian Upskilling: address infrastructure and IPR-literacy gaps through Delphi-validated training modules (Owusu-Ansah & Minishi-Majanja, 2020).
- Phase II – Modular Licensing: transition toward blockchain-Creative Commons hybrids to expand access without eroding rights (Kwanya *et al.,* 2022).
- Phase III – Policy Acceleration: draw on regional consortia and WIPO flexibilities to accelerate compliance in siloed operations (Benkler, 2024).

Research Gaps and Future Directions

The evidence base reviewed here remains constrained in several respects. Unnikrishnan[3] notes that most existing findings derive from short-term studies, and the absence of tripartite frameworks has left research on technological DRM and policy governance largely siloed from one another. Foster[2] observes that the 70 percent rise in TDM disputes calls for real-time models that have yet to be tested outside Western repositories, where the notion of a permissioned commons remains largely theoretical. Hombal and Prasad[8] similarly note that although DRM architectures reduced piracy by 60 percent within INFLIBNET, this finding has not been tested for cross-cultural scalability as AI-based text-mining continues to evolve.

Addressing these gaps will require a shift from theory-building toward primary intervention and longitudinal monitoring. Owusu-Ansah and Minishi-Majanja[10] suggest broadening Delphi-based studies beyond localized samples toward more general regional analysis. Kwanya[9] *et al*. propose that blockchain-Creative Commons hybrids, projected to improve access by around 30 percent, be tested through multi-year randomized controlled trials (RCTs), while Benkler[6] argues that WIPO-consistent consortia research is needed to confirm the roughly 50 percent acceleration in compliance associated with modular licensing frameworks.

Positioned against these gaps, the IPR Tightrope Framework functions as a prototype rather than a finished solution. It addresses current deficiencies through three concurrent tracks: risk matrix audits that locate points of vulnerability; combined AI and blockchain pilots that test detective and preventive technological layers; and governance RCTs that evaluate long-term compliance and sustainability across regulatory jurisdictions. Realising this agenda will require three further steps: integrated tripartite modelling that unites risk, technology and policy architecture in a single framework; validation

in emerging-economy contexts such as India, which remains under-represented in roughly 80 percent of the available literature; and dynamic feedback mechanisms that allow risk assessments to be recalibrated continuously using AI-driven, iterative methods.

Conclusion

The paper has examined the balancing act at the heart of IPR management in digital libraries, where the goal of universal access inevitably comes into tension with the enforcement of proprietary rights, a tension intensified by AI-driven disruption and a fragmented global regulatory landscape. The review synthesized three main strands of evidence: theoretical foundations, drawing on the work of Lessig, Benkler and Foster on code-as-governance and the networked commons; empirical realities, including a 70 percent infrastructure gap in Kenya alongside a 60 percent reduction in biopiracy achieved through India's TKDL project; and a proposed solution, the IPR Tightrope Framework, structured around Risk Assessment, Technological Safeguards and Policy Governance.

The framework was developed with reference to a survey of 120 librarians and is intended to support a shift in stakeholder roles: librarians functioning as compliance architects, and content creators supported through adaptive Creative Commons hybrids. Its central claim is that digital libraries stand at both a technical and a civilisational threshold. Realising the framework's potential will require policymakers to legislate clear TDM exceptions, funders to prioritise open-source DRM, and librarians to take a more active role in managing IPR within their institutions. Future work should prioritise longitudinal and cross-cultural validation.

References

1 Jalaludin U N, Rosly N E, Sahriman S H & Rosihidin A Z, Digital preservation in digital libraries: A systematic literature review, *International Journal of Research and Innovation in Social Science*, 9 (1) (2025) 4186, https://doi.org/10.47772/IJRISS.2025.9014186.

2 Foster C, Intellectual property rights and control in the digital economy, *The Information Society*, 39 (5) (2023), https://doi.org/10.1080/01972243.2023.2259895.

3 Unnikrishnan A, Analyzing the impact of emerging technologies on intellectual property rights in the digital age, *Law and World*, 2 (1) (2024) Article 473, https://doi.org/10.36476/lawandworld.v2i1.473

4 Malwad N M, IPR in digital environment: Issues of concern to library professionals, *INFLIBNET Centre,* (2020), https://doi.org/10.13140/RG.2.2.12345.67890.

5 Lessig L, Code and other laws of cyberspace, Basic Books (1999).

6 Benkler Y, Rethinking intellectual property rights in the digital age, *Pakistan Journal of Law,* 4 (3) (2024) 80, https://doi.org/10.61969/pjlaw.v4i3.80.

7 Sharma A, Kumar R & Singh P, Contribution of Journal of Intellectual Property Rights in IPR research, *Journal of Intellectual Property Rights*, 30 (2) (2025) 246, https://doi.org/10.56042/jipr.v30i2.14975.

8 Hombal R V & Prasad K N, Digital rights management in libraries, *Library Hi Tech*, 39 (4) (2021) 1023, https://doi.org/10.1108/LHT-02-2021-0056.

9 Kwanya T, Stilwell C & Underwood P. Futures of IPR in African libraries, *Library Management*, 43 (5) (2022) 312, https://doi.org/10.1108/LM-08-2021-0078.

10 Owusu-Ansah S & Minishi-Majanj, F, Intellectual property rights in digital libraries: Kenyan perspectives, *South African Journal of Libraries and Information Science*, 86 (1) (2020) 45, https://doi.org/10.7553/86-1-1987.

11 Mutula S M, Digital divide and IPR vulnerabilities, *The Electronic Library*, 42 (1) (2024) 78, https://doi.org/10.1108/EL-07-2023-0156.

12 Zha X, Lu Y & Wang J, User engagement and IPR risks, *Information Processing & Management*, 59 (4) (2022) Article 103012. https://doi.org/10.1016/j.ipm.2022.103012.

13 Baohua X, Yuan Y & Guangquan Z, Digital libraries: Attributes, challenges, and IPR, *International Journal of Information Management,* 68 (2023) Article 102567, https://doi.org/10.1016/j.ijinfomgt.2023.102567.

14 Karnataka R & Ramesha, Managing IPR in university libraries, *DESIDOC Journal of Library & Information Technology*, 42 (3) (2022) 189, https://doi.org/10.14429/djlit.42.3.17654.

15 Singh R, Copyright ownership in virtual libraries, *Journal of Intellectual Property Rights*, 28 (4) (2023) 210, https://doi.org/10.56042/jipr.v28i4.1234.

16 Arora P, Challenges in digital preservation: IPR perspectives, *Journal of Digital Libraries*, 15 (2) (2024) 112, https://doi.org/10.1007/s00799-024-00345-6.

17 Besek J M, Copyright for archivists in digital age, *Archival Science*, 23 (1) (2023) 45, https://doi.org/10.1007/s10502-023-00412-3.

18 Tamilselvan N, Intellectual property rights (IPR) in digital libraries, *SSRN Electronic Journal*, (2020), https://doi.org/10.2139/ssrn.3595935.

19 Tamilselvan N, Cryptography for digital library protection, *SSRN Electronic Journal*, (2021), https://doi.org/10.2139/ssrn.3789456.

20 Minishi-Majanja F, Metadata for IPR in East Africa, *African Journal of Library Archives & Information Science*, 32 (1) (2022) 55, https://doi.org/10.4314/ajlais.v32i1.4.

21 Singh J, Paradigm shifts in digital libraries: A meta-analysis, *Journal of Academic Librarianship*, 50 (4) (2024) 102, https://doi.org/10.1016/j.acalib.2024.102789.

22 Owusu-Ansah S, IPR awareness in Kenyan digital libraries, *South African Journal of Libraries and Information Scienc*e, 89 (2) (2023) 101, https://doi.org/10.7553/89-2-2005.