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PROTECTION OF INTELLECTUAL PROPERTY

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ABSTRACT

The protection of intellectual property (IP) in the digital age has become a critical concern, particularly due to the rapid growth of unauthorized copying and distribution of digital media. Since 1996, significant technological advancements have been made to safeguard digital content, focusing on methods such as digital watermarking, cryptography, electronic marking, and digital signatures. These technologies help prevent unauthorized access, reproduction, and distribution of digital works. Digital Rights Management (DRM) systems have been developed to enforce these protections, using techniques like access control, encryption, and digital watermarks. While DRM offers substantial security for content creators, it also raises concerns regarding its impact on innovation and fair use, particularly in academic and creative environments.

In India, the Copyright Act of 1957 was amended in 2012 to include DRM provisions, although enforcement remains less robust compared to countries like the US. The challenges of DRM in balancing copyright protection with public access are evident, especially regarding issues like sharing e-books and photocopying for educational purposes.

Emerging technologies, particularly blockchain, offer promising solutions for digital rights management by providing a decentralized and immutable ledger. Blockchain enables proof of ownership, supply chain management, and anti-counterfeiting measures, creating a secure environment for content creators to track and protect their works. Despite the advancements in DRM and blockchain, the balance between protecting creators' rights and promoting innovation remains a crucial issue for ongoing legal and technological development in digital content protection.

INTRODUCTION

In the digital era, the protection of intellectual property (IP) has emerged as a critical concern due to the increasing ease of reproducing and distributing digital content without authorization. As the internet becomes a primary medium for content dissemination, the risks associated with piracy, unauthorized copying, and infringement have grown significantly. To counter these challenges, extensive research since the mid-1990s has focused on the development of technological solutions aimed at safeguarding the rights of creators and content owners. Among these, Digital Rights Management (DRM), digital watermarking, cryptography, electronic marking, and digital signatures have become key technologies in copyright protection.

DRM systems aim to control access to and usage of digital content through mechanisms like encryption, access restrictions, and copy controls. While these technologies provide essential safeguards, they also raise concerns about hindering creativity and restricting fair use, especially in educational and research domains. Legal frameworks have evolved alongside these technologies, with countries like India amending their copyright laws to include provisions that support technological protection measures. However, enforcement remains a complex issue, and the balance between protecting the rights of creators and ensuring

public access to knowledge is yet to be fully achieved.

Recently, blockchain technology has emerged as a promising solution to some of the limitations of traditional DRM systems. Its decentralized and tamper-proof structure offers new ways to manage digital rights, track ownership, and enforce copyright. This paper explores the evolution of copyright protection technologies and their implications for legal systems, innovation, and the future of intellectual property in the digital landscape.

Since 1996, extensive study has been done on copyright authentication and protection. For research scientists and vendor consortiums, areas including digital water mark technology, cryptography, electronic marking, and digital signature are now the most important and pertinent. Content owners use a variety of protection systems including Digital Rights Managements (DRM) and/or Digital Watermarking due to the widespread illicit copying of media assets.

DIGITAL RIGHTS MANAGEMENT

Techniques that have been developed to restrict the reproduction, alteration, and dissemination of original works are included in digital right management. The writers or the designers of the original works claim that DRM measures are required to protect their interests by preventing unrestricted, free copying and distribution of their work. Few people, however, agree with the idea that DRM approaches obstruct innovation and creativity by preventing people from being inspired by other people's original work, creating unneeded barriers for the general public. The following are a few DRM strategies:

CONTROL OF ACCESS AND COPY

Software for access and copy control makes it possible for the author to monitor both legal and illegitimate uses of their work. These methods make sure that only those who pay have a claim to the product. Software in the category of access controls is made to make it difficult for users to obtain the initial copy of a piece of work unless they have the appropriate licence. Copy controls are software bits that aim to prevent people from reproducing works once they have got a copy. Implementing access controls is not particularly difficult. An example of this is a website that charges visitors a fee before providing a download option.[634]

ENCRYPTION SCHEMES

Creators can prevent any illegal access to their original work using encryption schemes. In the digital world, content encryption can be used to identify the authorised user. Digitally scrambling the bits that make up content is known as encryption, and it prevents the content from being plainly viewed until it is decrypted. The keys to decrypt the work are only accessible to authorised people.

DIGITAL WATERMARKS

The finest methods for assisting authors in tracking down the original creator of a work and any unauthorised duplicate or distribution of their original work are digital watermarks. Any unauthorised duplication or use can be identified thanks to the distinctive watermark that is included into the original work and links the use to it. In order for a detection device to determine whether the information being played or utilised is permitted and where its source was located, special elements that are not visible to the human eye are incorporated into the content. These details can include information on the creator, their rights, their distribution, etc. It might also include guidelines and information about copy control. There

[634] Zoya Nafis, "India: Protecting Copyright In The Digital Environment" https://www.mondaq.com/india/copyright/370058/protecting-copyright-in-the-digital-environment accessed 25 March 2025

are also different technological protection techniques available that can be used to stop copyright infringement and defend the interests of the writers. However, a lot of data is copied and circulated online instead of using these methods, which has a negative impact on the artists' rights.[635]

With the use of digital watermarking (DWM), which is a type of steganography, copyright and other source information can be secretly inserted into a piece of writing, an image, or a sound file without the user's knowledge while yet being retained in copies. It can identify authors and trace copies back to their rightful owners.

A digital signal or pattern that is immediately buried in digital content is known as a digital water mark technology. Any type of multimedia product, including still photos, audio files, video files, video clips, and text files, can be considered host data in the context of digital content. Any valuable information can serve as a watermark to demonstrate the owner's identity. The embedding watermark is the essential component of this digital water mark technology since the digital object and water mark are never separated. The original material is referred to as the cover of the digital item and the embedded message is known as the watermark. Once inserted, the watermark is undetectable in the digital object. After watermarking, the finished cover is referred to as cover.

The original must be changed into a different form as part of the watermarking of the digital object. Public key encryption, which also changes the original file's format, is contrasted with it. In the modern digital era, it is common practise to encrypt digital items, rendering them unviewable without decryption. Digital Water Mark Technology can be used to identify copyright violations in digital artefacts such as music files, photographs, movies, and three-dimensional models. They are an unnoticeable signature that is integrated into a digital entity in a way that prevents accidental changes to the digital object: The key that enables the watermark to be decoded and/or removed is only owned by the copyright holder.

CRYPTOGRAPHY

The earliest method used to guarantee the security and privacy of information transmitted through networks is cryptography. The protection of intellectual property rights has used cryptography. The cable and satellite television transmissions are frequently scrambled to prevent unlawful watching. Information is encrypted in this way so that only the authorised user may decrypt it and make it legible or comprehensible. This is a typical method for preventing computer viruses and unauthorised programme copying in order to protect sensitive data. Cryptography only secures the work during transmission, though. It offers no defence after the work or digital object has been decoded. Another way involves the use of encryption protocols, in which the document server compresses, encrypts, and delivers the data to a registered user, who then decrypts it using software provided by the network service provider to view it on their machine.[636]

ELECTRONIC MARKING

To disseminate electronic materials via the Internet and deter unauthorised

[635] Ibid

[636] "Copyright Issues Digital Environment" (2016) https://karmaveerlibrary.files.wordpress.com/2016/10/copyrightissues-in-digital-environment.pdf accessed 25 March 2025

copying, the electronic marking and identifying approach is used. In this method, each digital object is automatically tagged with a distinct and imperceptible mark created by the computer. The recipient of an illegally duplicated digital object is likewise registered by the computer. An unauthorised user would have a very tough time locating the distinctive marking system in the user's digital item. When digital objects are printed or faxed, this technology is utilised to safeguard copyright as well as electronic publishing.

DIGITAL SIGNATURE

Electronic signature is another name for a digital signature. Digital signatures are now necessary due to the internet and today's rapidly developing digital technology. It provides reliable and secure solutions, digital object integrity and authentication, and sender identification. It is a piece of digital information that is connected to a related digital object and acts as an authentication system. To meet the requirements for technological protection of copyrighted information in a digital context, digital signature is now the most suitable form. Cryptography, a technique of encryption and decryption, can be used to define digital signatures. This procedure involves passing information through an encryption step to create an encrypted copy that is then further decrypted and converted back to the original plain text by using the cypher key. The idea behind this is to render the data unreadable to anyone besides the selected parties. Information is altered via this process so that only the sender and receiver may view it.[637]

To safeguard the original work, many different strategies have been developed, including digital watermarking, access controls, and copy controls. The control and protection of original works in the digital world still need to be accomplished, despite the fact that these procedures have been included in the laws. It is crucial that ideas be accessible to the broader population in order to prevent the creative process from being stifled. However, authors and artists must always receive compensation for their work. Therefore, when adopting and implementing DRM systems, both parties' interests must be taken into consideration.

Through an update to the Indian Copyright Law in 2012, a few DRM requirements were included. The Indian Copyright Act, 1957 was amended to include Sections 65A and 65B. The Indian law's DRM requirements are not as comprehensive and wide as the legislation in the US. Being held accountable for the inadequate protection and enforcement measures, it is past time for India to strictly adhere to these DRM rules and prevent copyright infringement in the digital sphere. It is important to remember that there should always be a balance between copyright holders and common users.[638]

FAIR USE AND DIGITAL RIGHTS MANAGEMENT (DRM)

Publishers currently rely on Digital Rights Management as a result of the ease and low cost of duplicating digital content (DRM). The publishers can now govern the electronic resources in accordance with the licencing terms because they are encrypted. An e-book, for instance, can be licenced to a single user and the file will only function on one specific device. This differs noticeably from how conventional printed books operate. With printed books, we frequently lend them to friends and coworkers. However, if DRM controls are implemented, such sharing is impossible (Denise M. Davis & Tim Lafferty, 2002). DRM is

[637] "Copyright Issues Digital Environment" (2016) https://karmaveerlibrary.files.wordpress.com/2016/10/copyrightissues-in-digital-environment.pdf accessed 25 March 2025

[638] Zoya Nafis, "India: Protecting Copyright In The Digital Environment' (Mondaq, 30 January 2015)" https://www.mondaq.com/india/copyright/370058/protecting-copyright-in-the-digital-environment accessed 25 March 2025

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referred to as "digital restrictions management" by a number of rights organisations. Section 65A of the Indian Copyright Act, 1957, titled "Protection against Circumvention of Technological Measures," has been incorporated. This clause makes it illegal to tamper with the DRM security measures. DRM restrictions limit the range of fair use options available to academic institutions and libraries. For instance, even though a book is protected, it is acceptable to photocopy it for educational purposes. However, a digital book that is restricted from printing cannot be produced unless a technological precaution (like encryption) is disregarded. Despite being permitted under Section 52's fair use exceptions, this behaviour is now illegal.[639]

BLOCKCHAIN TECHNOLOGY

A blockchain is a highly secure decentralised public ledger that is used to record all peer-topeer transactions that happen from various nodes, making it impossible to change the record retroactively without changing all subsequent blocks and getting network consent. "Consider it as a gigantic Google-Doc Interactive spreadsheet that anyone can view on demand and administrators can continually verify and update to confirm each transaction is valid," says Melanie Swan, founder of the Institute for Blockchain Studies, in a clear and concise explanation of the technology.

Thus, it may be seen as a system that permits the transfer of digital assets from one person to another, with a record of that transfer being kept in a file that serves as an open ledger or chain of transactions that is accessible to all blocks. Its decentralised and fault-tolerant nature makes it appear like a great tool to address the data copyright issue plaguing the entertainment industry.

DECENTRALIZED DATABASE TECHNOLOGY

Its decentralised database system is perfect for tagging and preserving original works of art, digital intellectual property, papers, manuscripts, pictures, images, and other types of media. It also protects against copyright infringement. As a result, even if a copyright provider were to go out of business, there would still be a verifiable copy of the original digital artwork stored on the Blockchain, which would remain untouched.

This content is maintained separate from central data. A centralised database, on the other hand, is only as reliable as the entity that controls it. If this entity engages in unethical behaviour, the database will collapse, creating trust concerns and possibly invalidating the information.

EVIDENCE OF CREATORSHIP

Due to its ability to offer proof of their invention, use, qualification requirements, and status, blockchain technology also plays a significant role as a proof of evidence of creatorship. A time-stamped record will be created when an original work and its creator's information are uploaded to a blockchain, serving as crucial proof of the piece's original ownership. Numerous Blockchain start-ups are currently working on distributed ledger technology-based repositories for unregistered intellectual property rights, which could be an intriguing and controllable option for copyright protection and digital rights management.

SUPPLY CHAIN MANAGEMENT

The makers may be able to check their contractual agreements for distribution and identify leaks in their distribution activities if they can trace their work on an unchangeable Blockchain. All supply-

[639] Madhu K S and Gagan, 'Copyright Fair Use and Libraries' in Priya Rai, R K Sharma, P K Jain, and Ranbir Singh (eds), *Transforming Dimension of IPR: Challenges for New Age Libraries* (National Law University, Delhi 2015) ISBN 978-93-84272-03-6 http://nludelhi.ac.in/download/publication/2015/Transforming%20Dimension%20of%20IPR%20-%20Challenges%20for%20New%20Age%20Libraries.pdf accessed 25 March 2025.

related data will be available on Blockchain, making it simple for artists to monitor all transactions details in the event of any copyright infringement.

ANTI-COUNTERFEITING AND ENFORCEMENT OF COPYRIGHT

Everyone in the supply chain would be able to verify a real work and tell it apart from a fake if there was a ledger that listed who owned what, who is an authorised licensee, and other information. Since a blockchain ledger can document every factually verifiable detail about the work, it may hold copyright information in a legitimate way. Businesses, authorities, consumers, and insurers can have trust and peace of mind thanks to these Blockchain solutions, which are quickly gaining popularity and are making it possible for users to confirm the legitimacy of a work.[640]

CONCLUSION

The evolving landscape of digital content demands equally adaptive and robust mechanisms for the protection of intellectual property rights. Technologies such as DRM, digital watermarking, cryptography, electronic marking, and digital signatures have significantly contributed to preventing unauthorized reproduction and distribution of original works. While DRM remains a widely used approach, its limitations—particularly in terms of user restrictions and interference with fair use—have drawn criticism from scholars, educators, and consumer rights advocates. The inclusion of DRM-related provisions in India's Copyright Act through the 2012 amendment marks progress, yet enforcement and practical implementation remain areas that require further attention.

As digital ecosystems grow more complex, blockchain technology has introduced a transformative approach to IP protection. Its decentralization, transparency, and immutability provide a credible infrastructure for recording ownership, managing rights, preventing counterfeiting, and tracing content through the digital supply chain. It not only enhances copyright enforcement but also empowers creators by giving them greater control over their intellectual assets without dependence on central authorities.

Nonetheless, the ultimate goal must be to strike a balance between protecting creators' rights and promoting the free flow of ideas and information. Innovation thrives in an environment that respects both ownership and open access. Legal frameworks and technological tools must evolve in harmony to ensure that neither the creators' incentives nor the public's right to information is compromised. Moving forward, collaborative efforts between technologists, lawmakers, and content stakeholders will be essential to build a fair and secure digital future for intellectual property rights.

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[640] Ibid

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