Abstract

The global shift towards digitalization is reshaping the environment of business interactions, challenging the traditional structures as well as altering the way consumers access goods and services. In the digital world safeguarding of intellectual property rights present a significant challenge. As businesses increasingly rely on IP for having competitive advantage understanding how it is utilized safely in the digital age remain a critical yet underexplored area. The intersection of intellectual property rights (IPR) and privacy in the digital age presents complex challenges and opportunities. Rapid technological advances have led to changes in the creation, distribution and protection of intellectual property, and the need for improved regulatory frameworks and systems for these exchanges This study examines the challenges of aspects that converge in the digital environment, including the spread of online piracy, digital content infringement, and the impact of global connectivity on IPR enforcement.

The study takes a closer look at the current legal landscape, examining how jurisdictions around the world are addressing these challenges. Particular emphasis is placed on recent legislative developments, such as the Digital Personal Data Protection Act, 2023, which seeks to align data privacy with intellectual property protection. The case studies show that legislations applicable to digital assets security while balancing individual privacy rights.

Technological solutions including digital rights management (DRM) systems, blockchain technology, and digital fingerprint systems are required as ways to enhance IPR protection Existing regulatory frameworks assess the quality of these solutions works well, focusing on the role of preventing unauthorized access and distribution of digital content.

Recommendations are presented to address gaps in current legislation, promote international cooperation and raise public awareness. By creating an environment that fosters innovation while protecting privacy, this study aims to contribute to the ongoing discourse on reconciling IPR and privacy in the digital age.

Introduction

In the digital world, economic activities are transitioning swiftly to online platforms reshaping traditional mode of connectivity. The propagation of technologies and platforms likethe Internet, artificial intelligence (AI), robotics, 5G, the Internet of Things (IoT), data analytics catalyzed the emergence of entirely new industries which are fundamentally altering our ways of life.

IP pertains to any original creation of the human intellect, spanning artistic, literary, technical, or scientific domains. Intellectual Property Rights (IPR) refer to the legal rights granted to the inventor or creator to safeguard their invention or creation for a defined duration[1]. These rights confer exclusive privileges to the inventor/creator or their assignee, enabling them to fully exploit their creation for a specified period. It is widely acknowledged which IP plays a pivotal role in the modern economy, recognizing the significant intellectual labor associated with innovation. The escalating costs of research and development (R&D) had heightened the stakes for technology developers, necessitating protection against unlawful exploitation to recoup investments and ensure adequate profits for sustained R&D investments[2]. Each IPR provides the inventor or creator with specific rights, promoting skills and social development, and facilitating economic benefits. Based on the type of invention, creation, and their applications, intellectual property rights are classified as follows:

i) patents,

ii) trademarks,

iii) industrial designs,

iv) layout designs of semiconductor integrated circuits,

v) geographic indications of source,

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[1] Y. Awasthi & A. Saxena, 'Intellectual property Rights: A Study' in Intellectual Property Rights challenges in digital environment, 60-64p. (2015).

[2] M.H. Calad, 'Knowledge Management Processes and Intellectual Property Management Processes: An integrated conceptual' AD-minister No, 137 – 160p. (2017).

vi) copyright and related rights, which include literary and artistic works, musical works, artistic works, photographic works, motion pictures, computer programs, and performing arts and broadcasting works.

Patent

A patent is an intellectual property right granted by the relevant government agency to a technological inventor. The term "design" refers to the solution of a problem, which may involve the manufacture of a product or process. Patents are considered the most valuable of the intellectual property rights, and rightly so[3].

Trademark

A trademark is a distinctive mark or mark that identifies a particular product as the manufacturer or issuer of a particular person, firm, or company. Like trademarks, service marks distinguish service companies from their competitors. A company may use trademarks for its products, but it uses trade names to distinguish itself from other companies or industries[4].

Trademarks and trade names help companies build recognition, reputation and trust among consumers. Consumers generally rely on trademarks when it is difficult to quickly evaluate a product or service to assess its quality. A significant portion of the consumers are especially brand lovers and are willing to pay a premium for a brand name, even for similar quality products, in order to stand out from the crowd.

Copyrights and Related Rights

Copyright protects the expression of ideas by writers, artists, and other creators, especially in mass communication. It only protects the form of expression, not the underlying idea itself. The development of any nation or country is closely linked to the creativity of its people.

Over time, technological advances have brought new ways of exploiting content and violating intellectual property rights. Regulatory instruments have consistently emphasized that existing rights continue to apply to new media, including digital and online channels for the distribution of intangible assets but destruction of content the slow pace and distribution mechanisms have

[3] Chudasama, Dhaval. (2022). Importance of Intellectual Property Rights. 4. 2021. 10.37591/JIPRL.
[4] Narayanan S, Intellectual property rights economy vs. science and technology, International Journal of Intellectual Property Rights, 1(1) (2010) 6-10.

made the realization of these opportunities more difficult [5]. Data security and privacy incidents pose significant risks to data privacy, confidentiality and accessibility, negatively affecting users and data owners. Importantly, such incidents also can have severe consequences for holders of intellectual property rights. Unauthorized access, use, or disclosure of data may jeopardize the IPR owner's income, reputation, and competitive advantage.

Recognizing the relationship between privacy, data protection and intellectual property rights requires considering privacy and data protection as nuances of IPR. From this perspective, individuals and organizations have the right to be created data protection, such as intellectual property rights. The basic concept is based on the understanding that data especially personal data is an asset that can benefit its owners economically and socially[6]. Data protection and privacy should be addressed through legal frameworks and mechanisms to protect the rights and interests of IPR holders. This includes implementing strong data protection measures, enforcing and monitoring rules that protect against unauthorized access and misuse recognize compliance with privacy laws and standards[7].

In this paper we will be covering the various aspects of IPR rights in India i.e Trademarks, patents and copyrights along with the challenges faced with regards to privacy and security in this digital era.

Background

The foundation of laws and administrative procedures concerning Intellectual Property Rights will be traced back to Europe[8] . The practice of granting patents dates back to the fourteenth

[5] P. Vishwakarma & B. Mukherjee, 'Knowing protection of intellectual contents in digital era' in Open Source Technology: Concepts, Methodologies, Tools, and Applications, 2-4, 870-888 (2014).

[6] Driouchi, A., & Kadiri, M. (2013). Challenges to intellectual property rights from information and communication technologies, nanotechnologies and microelectronics. In *Digital Rights Management: Concepts, Methodologies, Tools, and Applications* (pp. 1474-1492). IGI Global.

[7] Hussein Ali, A., & Sabah Latif, M. (2023). Contemporary Challenges in Regulating and Protecting Intellectual Property. *Marwa, Contemporary Challenges in Regulating and Protecting Intellectual Property (June 27, 2023)*.

[8] R. Ghafele & B. Gibert, 'The link between intellectual property rights, innovation, and growth: A meta-analysis', Economic Modelling, 97, 196-209 (2011).

century cover various aspects such as the right to manufacture, sell, or use a particular invention or process. Many consider Venice, Italy as the birthplace of the IP systems where legal thinking pioneered and establishment of laws and systems happened serving as model for other countries[9].

The concept of intellectual property begun taking shape in16th-18th centuries as firms pursued way to safeguard their product and invention from imitations. Notably expansion of European colonialism had played a significant role for driving the development of IP rules as these regulations had enabled firms to expand its operations more lucratively across the colonial territories. Throughout the span of 19 and early 20th century several ad-hoc IP regime evolved as more formalized structures at national as well as international levels[10] . The Paris Convention in the year 1883 marked as a significant milestone which laid the groundworks for subsequent international IP legislations which continued developing in the early 20th century .

Key principle were established in these early administrations like the "right of priority," remained fundamental in all modern IP frameworks allowing owner of IP rights in one particular country asserting their rights in other countries which are part of relevant IP agreements[11] . In the recent decade, substantial progress in IP regulation had taken place with the formation of powerful global institutions dedicated to intellectual property. The creation of the World Intellectual Property Organization (WIPO) and the inclusion of the Trade-Related Aspects of Intellectual Property Rights (TRIPS) agreement in the World Trade Organization (WTO) in 1995 had played pivotal roles in strengthening IP regimes worldwide . The World Intellectual Property Organization (WIPO) was founded in Stockholm in 1967 with the primary mission of protecting Intellectual Property Rights (IPR) worldwide and later became a flagship agency of the United Nations in 1974[12]. WIPO establishes and monitors IPR policies worldwide . Its main objective is to promote economic, social, sustainable development and

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[9] Bainbridge DI. New York: Longman; 2002. Intellectual property.

[10] Kannan, 'Importance of Intellectual Property Rights', International Journal of Intellectual Property Rights, 1(1), 1-5 (2010).

[11] S. Sankar Narayanan, 'Intellectual Property Rights Economy vs Science & Technology', International Journal of Intellectual Property Rights, 1(1), 6-10 (2010).

[12] https://www.wipo.int/treaties/en/convention/

cultural development while preserving biodiversity and traditional knowledge through a balanced and effective international IP system. These developments had led to the establishment of robust intellectual property frameworks among WTO member states.

Copyright law, like patents, traces its origins back to Renaissance Italy, although one of the most well-known early copyright laws is the English Statute of Anne of 1710 . Early copyright legislation primarily served the interests of domestic printers rather than authors and were influenced, to some extent, by censorship. While its main purpose were to prevent unauthorized printing, reprinting and publishing of books and writings, as well as to encourage the creation of useful books, the Statute of Anne primarily arose from a campaign by the Company of Stationers, an association of printers, to regain control over the English book trade, rather than being a law designed to protect the rights of authors.

The journey of copyright in India dates back to 1847 when the first copyright act were enacted, followed by a modified version in 1914[13]. The development of copyright law in India closely mirrored which of British copyright law, with several amendments made over the years to align with international conventions . In 1983, amendments were made to the copyright act to leverage benefits from revisions to the Berne Convention and the Universal Copyright Convention, both of which India is a signatory to.

Subsequent amendments in 1992 extended the term of copyright protection from the author's lifetime plus 50 years to the author's lifetime plus 60 years. The Copyright Act of 1957 replaced the 1914 act and came in force on January 21, 1958. The act underwent five amendments in the years 1983, 1984, 1992, 1994 and 1999, with the amendments declaring infringement of copyright as an economic offense[14] .

The Copyright (Amended) Act of 2012, also known as the new copyright bill, were passed by the Indian Parliament on Will 17, 2012. These amendments aimed to bring Indian Copyright Law in line with international standards, the WIPO Copyright Treaty (WCT) and the WIPO

13 P. Vishwakarma & B. Mukherjee, 'Knowing protection of intellectual contents in digital era' in Open Source Technology: Concepts, Methodologies, Tools, and Applications, 2-4, 870-888 (2014).

14 D.R. Singh, Law relating to intellectual property: a complete comprehensive material on intellectual property covering acts, rules, conventions, treaties, agreements, digest of cases and much more. (Vol. 1, Universal Law Publishing Company, 2008).

Performances and Phonograms Treaty (WPPT), collectively referred to as the Internet Treaties[15].

Chapter overview

Literature Review

The exploration of intellectual property rights in literature were traced back to works of classical economists like Adam Smith and extend even further in the history. As a result, the accumulated volumes of literature on the subject is vast, with only a fraction feasibly covered in any survey.

Recently interest towards intellectual property rights surpassed the confines of law and economics departments in universities[16]. Disciplines which had traditionally not consider IPRs relevant now become engaged in the discourse. The intellectual property literature witnessed proliferation and expansion attracting researchers from diverse field like sociology, anthropology, ethnobiology, international relations as well as political science[17].

A review of the literature on intellectual property highlighted the late 1990s era being IP a lengthy relatively modest tradition[18]. The tradition were categorized by shattering across the various type of intellectual property rights ,including patent, trademark, copyright and others as well as across different academic discipline like economics and law and management[19]. Authors noted the existence of several previous review of the literature dating back to the 1950s. However, these reviews primarily focused on economics, the economics of the patent

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[15] J. Gervais, The TRIPS Agreement: Drafting history and analysis (3rd ed., Sweet & Maxwell, 2010).

[16] J. K. Davis & L. R. White, 'Patents and Technological Innovation: An Empirical Analysis', Journal of Technology Innovation, 8(3), 189-211 (2019).

[17] Depoorter, 'Copyright Enforcement in the Digital Age: When the Remedy is the Wrong', UCLA Law Review, 66(4), 976-1026 (2019).

[18] D.I. Bainbridge, Intellectual property. (Pearson Education; New York: Longman, 2006).

[19] D. Petrova & Sv. Panayotova, 'Europe 2020 – Digitalization and consequences on the labor market' in Sbornik dokladi ot Nauchna konferenciya Aktualni problem na sigurnostta", 25-26 October 2018, IK NVU "Vasil Levski", Veliko Tarnovo, Vol. 2, 141-150, ISSN 2367-7465 (2018).

system, rather than the management of IP. The underscores the historical emphases on the economic aspects of IP research and the relatively limited attention given to the strategic management of IP assets in organizations.

Another study marks the first identified review explicitly dedicated to the management of intellectual property . Authors highlights the increasing significance of IP management and the burgeoning interest in the academic realm[20]. The surge in interest will be attributed in part to the establishment of the Court of Appeals for the Federal Circuit (CAFC) in the US during the 1980s. The creation of CAFC fostered a notable uptick in patenting activity, resulting in a more intricate IP landscape and an escalation in litigations.

Research indicates which litigated patents tend to possess more patent claims and receive more citations per claim. Inventions involved with complex multi-invention technologies are supposed to be more prone towards litigation[21]. Moreover, patents had undergone enforcement and validation in courts tends to be more valuable than those which had not been tested via legal proceedings. In addition to reviewing of the existing literature, several reserachers identified areas needing further research, likeIP valuations which had emerged as growing sector[22]. They also highlighted variation in IP management practices in firms across the different industries emphasizing the diverse approach adopted in managing respective IP assets.

Current Status of Digital IPR in India

The legislative framework in India for securing IP, including digital IP, is comprehensive. It had been adapted to accommodate the challenges and opportunities presented by digitalization, with revisions made in accordance with agreements like the Trade-Related Aspects of Intellectual Property Rights (TRIPS). The TRIPS Agreement establishes basic benchmarks for

[20] M. Afoaku, 'The reality of augmented reality and copyright law', Northwestern Journal of Technology and Intellectual Property, 15(2), 4 (2017).

[21] P. Vishwakarma & B. Mukherjee, 'Knowing protection of intellectual contents in digital era' in Open Source Technology: Concepts, Methodologies, Tools, and Applications, 2-4, 870-888 (2014).

[22] M., Lavanya & Sharma, Rahul & Soni, Patrika & Dubey, Amit. (2022). Intellectual Property Rights (IPRs) and its role in propelling the growth of the MSME sector. The Journal of World Intellectual Property. 25. 10.1111/jwip.12243.

safeguarding copyrights and related rights, trademarks, geographical indications (GIs), industrial designs, patents, integrated circuit layout designs, and undisclosed information. It also sets out minimal criteria for enforcing intellectual property rights (IPRs) through civil procedures for infringement, measures at borders, and, particularly concerning copyright piracy and trademark counterfeiting, through criminal proceedings[23].

India had outlined a roadmap for intellectual property rights (IPR), encompassing digital IPR [24]. The legislative framework for securing IPR in India includes:

- The Indian Contract Act, 1872.
- The Trade Marks Act, 1999.
- The Copyright Act, 1957 (14 of 1957).
- The Patents Act, 1970.
- The Designs Act, 2000 (16 of 2000).
- Geographical Indications of Goods (Registration and Protection) Act, 1999.
- Information Technology Act, 2000.
- The Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021
- Digital Personal Data Protection Act, 2023

Over the past few decades intellectual property rights evolved as one of the cores of economic development. At multidimensional level, the successful launch of the Agreements on Trade-

[23] https://testbook.com/ias-preparation/trips-agreement

[24] Intellectual Property watch, 'Inside Views: Development In Indian IP Law: The Copyright (Amendment) Act 2012', Retrieved on 2 3 / 0 1 / 2 0 2 0 from https://www.ip-watch.org/2013/01/22/development-in-indian-ip-law-the-copyrightamendment-act-2012/ (2012).

Related Aspects of Intellectual Property Rights (TRIPS) in the World Trade Organization (WTO) elevated the enforcement of IPRs to status of solemn international commitment[25].

In year 2016, India unveiled comprehensive National IP Policy whose primary focus were to raise awareness and enhance administrative capacities of intellectual property. As part of the initiative the portfolios of copyrights as well as semiconductors were transferred to the Department of Industrial Policy and Promotion under the Ministry of Commerce. The Cell for Intellectual Property Promotion and Management (CIPAM) were established for overseeing the implementation of the IP policies and facilitating interagency coordination.

In order to address the backlog of patents and trademarks measures were also taken. The Copyright Board was merged with IP Appellate Board for streamlining the process. The Indian Patent Office recruited 458 examiners for expediting patent and trademark evaluations, thus ensuring more efficient handling of intellectual property matters[26]. These efforts signify Indian commitment towards strengthening of its intellectual property framework and nurturing innovation and economic growth.

Indian courts also had rendered significant judgment which dealt with Digital Rights Management (DRM) practices. A notable case that exemplifies the controversial nature of DRM is the Sony BMG Copy Protection Rootkit Scandal in 2005[27]. Sony BMG used DRM software along with music CDs that surreptitiously installed hidden rootkits on users' computers during creation, which was intended to prevent unauthorized copies. This led to widespread controversy. Consumers discovered invasion of privacy and security risks related to hidden software. The group has been sued several times alleging violations of privacy rights and consumer protection laws. The Sony BMG case highlighted the ethical and legal challenges surrounding DRM and consumer rights. Customers claimed that installing the rootkit violated their privacy and exposed them to security threats they did not approve of. At the time of the

[25] Aditi Chauhan & Kashmir Singh, 'Intellectual Property Rights in the Digital Age: Scopus-Based Review of Research Literature', 10, 131-144 (2023).

[26] Debojoyti Chakraborty, 'Copyright Challenges in the Digital Age: Balancing Intellectual Property Rights and Data Privacy in India's Online Ecosystem', SSRN 4647960 (November 29, 2023).

[27] Perzanowski, Aaron and Deirdre Mulligan. "The Magnificence of the Disaster: Reconstructing the Sony BMG Rootkit Incident." Berkeley Technology Law Journal 22, no. 3 (2007): 1157-1232. (Work published when author not on Michigan Law faculty.)

Sony BMG scandal, although India was not a signatory to the WIPO Copyright Treaty (WCT) or the WIPO Performance and Phonograms Treaty (WPPT), there was national copyright law has provisions that allow limited flexibility in specific circumstances.

The recent amendments in the Information Technology Act, 2000 had strengthened the intellectual property protections in India. Section 4 of the IT Act, 2000 provide legal recognitions of electronic records while Section 10A recognize e-contracts to be legally valid[28]. Section 5 of the IT Act, 2000 grant legal recognition to electronic signatures. All these provisions form the backbone of India's regulatory framework for electronic commerce (e-commerce) and digital governance. They promote acceptance of electronic transactions, improve efficiency, reduce administrative burdens, and facilitate seamless communication between the public and private sectors Provide legal certainty and authenticity for electronic records, signatures and agreements, the IT Act supports economic growth, innovation and technological advancement in India with digital economy.

For combating cybercrime and enhancing IP protection the IT Act include provisions to prevent unauthorized accesses and tampering of computer source documents. Section 65 prohibit tampering of computer source documents and any act against it is punishable with imprisonment for up to three years and a fine of up to 2 lakh rupees, or both. Section 65 also provides legal guarantees for the admissibility of electronic evidence in court proceedings relating to cybercrime. Establishes a clear legal framework for the investigation, prosecution and adjudication of cases involving the unauthorized use or modification of electronic documents

Discussion

In today's digital economy technologies have taken a center stage prevailing the physical technologies from the industrial age[29]. The evolution of products, markets and industries revolving around these technologies primarily was propelled by new ventures which are digital technology-based start-ups. The startups engages in simultaneous process of technology

[28] Debojoyti Chakraborty, 'Copyright Challenges in the Digital Age: Balancing Intellectual Property Rights and Data Privacy in India's Online Ecosystem', SSRN 4647960 (November 29, 2023).

[29] M. Castells, The Rise of the Network Society (Vol. 1) (John Wiley & Sons, 2000).

development and business model developments where they make critical decisions about the management of their intellectual properties.

Challenges in IPR due to Digitalisation

Research suggest countries lacking clear established intellectual property rights protection systems tends to experience high rate of online piracy. On the other hand strict enforcement of IPR protection correlate to low prevalence of online piracy[30]. Evidence further accentuate the expansion of internet access facilitating widespread illegal download of media contents whether for personal uses or resale purposes.

Indeed digital transition ushered in new opportunities for intellectual property creations but it also introduced challenges in digital asset protection. Traditional methods of enforcing IP rights becomes more challenging as a result of the ease in digital reproduction and distribution. The spread of challenges like copyright infringements, software piracy and unauthorized uses of digital contents stresses the necessity for stringent legal solutions.

Navigating these complexities require careful considerations of legal and ethical framework for ensuring compliance with data protection regulations along with facilitating innovation and technological advancements. Companies needs to implement rigorous data protection measures having transparency mechanisms for safeguarding individuals' privacy rights for leveraging the potential of data-driven technologies in business growth and development.

Case Study Analysis

Indian courts issued several judgments upholding the trademark right of rightful owners in IPR cases. We will be discussing few cases in the below section:

One of the earliest judgments in case of cybersquatting in India were delivered by the Bombay High Court in the case of *Rediff Communication v. Cyber booth*[31]. The court emphasised value and importance of domain name at par to corporate assets equivalent to any other assets of a company. In the case the defendant had registered the domain name "radiff.com," which were similar to "rediff.com." The court ruled out in the favor of the plaintiff, stating domain names are more than just Internet addresses and deserves protection at par to trademarks. While the

[30] Svetla Panayotova & Ventsislava Nikolova-Minkova, 'INTELLECTUAL PROPERTY IN DIGITAL ENVIRONMENT' (2020).

[31] Rediff Communication Limited v. Cyberbooth & Anr. AIR 2000 Bombay 27

Trade Marks Act, 1999 does not expressly provide limitation periods for trademark infringement, Indian courts consistently recognized importance of safeguarding intellectual property rights was always proactive in adjudicating cases of cybersquatting for protecting the interests of trademark owners.

In the case of *Super Cassette Industries v. Myspace Inc*. (2011) 48 PTC 49[32], the plaintiff had filed a lawsuit seeking for an injunction for restraining copyright infringement along with claiming resulting damages. Defendant No. 1 were a social networking site based in US offering various entertainment applications, including music and image sharing. Defendant No. 2 were the owner of Defendant No. 1, which provided a free online network platform for consumers. The plaintiff argued about the defendants having allowed users to share multimedia contents including infringing songs and pictures over the internet. The site also featured inbuilt search feature to upload and download music, storing of these files on its servers but in its own software formats. Although the defendants prohibited copyright infringement at their terms of uses and also implemented a digital rights management tool to copyrighted owners for registering their works the court found them to be prima facie permitting infringement for profit as foreseen under Section 51(a)(ii) of the Copyright Act. It is noteworthy that under the amended IT Act, 2000, Section 79(3) explicitly state about exclusions of liability available to intermediaries does not apply in cases of conspiracy or abetment. The emphasizes importance of intermediaries undertaking proactive measures for prevention of copyright infringements to avoid liabilities under the law.

In the case of *Syed Asifuddin & Ors v. The State of Andhra Pradesh & Anr, Tata Indicomm*[33] several employees were arrested for allegedly hacking of computer source code under Section 65B of the IT Act, 2000. The employees were accused of manipulation of the electronic serial number (ESN), a 32-bit number programmed inside cell phones exclusively for use on the Reliance service network. The court held such tampering of code constitutes a punishable offense under the Section 65 of the IT Act, 2000. The court ruled the activity not to be covered in the fair use exceptions for copyright infringement under the Section 52 of the Copyright Act, 1957. The is because the tampering does not qualify as reverse engineering for the purpose it were supplied for (i.e., working on the Reliance network) or for inter-operability, as Tata

[32] *Super Cassette Industries v. Myspace Inc*. (2011) 48 PTC 49

[33] Syed Asifuddin And Ors. vs The State Of Andhra Pradesh And Anr. on 29 July, 2005. 2006(1)ALD(CRI)96, 2005CRILJ4314, 2005 CRI. L. J. 4314, 2006 (1) AJHAR (NOC) 4 (AP), 2006 (1) AKAR (NOC) 4 (AP), 2005 CLC 1685 (AP), 2006 (1) ALD(CRL) 96

Indicomm were a competitor of Reliance. Also, the reverse engineering were not conducted for lawful purposes.

In the case of *Tata Sons v. Greenpeace* (178 (2011) SLT 70)[34], Tata sued Greenpeace for its online defamation and trademark infringement, seeking an sanction and payment of damages of ten crores. Greenpeace published an online game titled "Tata v Turtle," which unauthorizedly had used Tata's trademark. The plaintiff argued the game caused damage to its reputation by unlawfully criticizing of its Dharma port project. The court further granted restraining orders against the defendant, prohibiting them for conducting any business or further using Tata's domain name or mark. Section 135 of the Trademark Act, 1999 provide legal remedies for suits which involves infringement of registered trademarks or passing off. The remedies include injunctions, damages, account of profits or delivery up/destruction of infringing goods. Besides, Sections 103 and 104 of the Trademark Act imposes penalties on certain act related to false trademarks. Section 103 deal with the act of applying a false trademark on goods making it punishable with minimum of six months imprisonment, extending to three years as well as a fine ranging from 50,000 to 3 lakhs. Similarly, Section 104 punish the act of selling goods/services with a false trademark descriptions.

The case of *Ferid Allani v. Union of India and Ors*[35]. provides clarity on the patentability of computer program and related inventions under the Patents Act, 1970. The Delhi High Court emphasised on many inventions in today's world are being based on computer programs including innovations for artificial intelligence, blockchain technologies and other digital products. The court highlighted it would be retrogressive to argue about all such inventions being non-patentable solely because they are based on computer programs. Instead, the court acknowledge computer programs to include certain ancillary element or developments and these innovations that is patentable and should not automatically be deemed non-patentable. However, in terms of practice, the court indicated for software inventions to be patentable, they should involve a tangible component which is typically a combination of hardware and software. The requirement ensure the invention going beyond mere abstract ideas or algorithms and include a practical applications or implementation which bring tangible benefits or technical effects. By requiring a tangible component, like hardware to become part of the invented software, the court aim to ensure patented inventions in the computer programs

[34] *Tata Sons v. Greenpeace* (178 (2011) SLT 70),
[35] Ferid Allani vs Union Of India & Ors on 12 December, 2019. Delhi High Court

contributes to technical progress and provide real-hardware solutions or improvements, rather than just being purely theoretical or conceptual in nature.

New Regulations to address the issues

In recent years, India has made significant progress in updating its legal framework to address the challenges of digital governance, data security and cybersecurity with the enactment of the Digital Personal Data Protection Act, 2023 (DPDP Act). remains a cornerstone in protecting personal data. These laws impose strict provisions such as requirements for explicit consent for data processing, rights of data subjects including access and storage, and obligations of data controllers to ensure transparency and protection Despite the lack of universality, especially in small and medium enterprises.

At the same time,, the Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021, seeks to regulate social media intermediaries, digital media and OTT platforms. This act mandates arbitrators to conduct due diligence on content in the process of implementation and requires the appointment of complaint officers to resolve user complaints in a timely manner. Aiming to maintain online safety and ethical standards, issues arise about balancing free speech and regulatory oversight, as well as the practical burden of meeting compliance smaller on This regulatory framework, although necessary to maintain digital ethics, also involves intellectual property rights that guide containment practices.

In addition, India is developing its approach to non-personal data through initiatives designed to address privacy concerns and ensure appropriate data economic practices to enable data sharing in the public interest has been weakened. The data localization requirements aim to protect customer data privacy by requiring certain types of data to be stored across Indian borders, and affect how companies manage and protect the intellectual property in their data. Challenges here include defining explicit ownership rights and preventing misuse of data, even in the non-personal sphere.

In cybersecurity, the draft National Cybersecurity Strategy 2021 emphasizes the need for greater infrastructure resilience, capacity building in cybersecurity skills and international cooperation to control cyberspace threat management effectively This policy interacts with privacy and IPR, particularly in the area of protecting digital assets and proprietary information from various cyber threats. Key challenges include implementing the system across sectors and

ensuring seamless collaboration between government agencies and private organizations. The draft e-commerce policy outlines mechanisms for regulating e-commerce practices, including data localization requirements and consumer security standards. Issues such as the impact on global trade relations and fostering fair competition among e-commerce players remain important concerns.

Technical Solutions for Protecting Intellectual Property Rights

In today's digital environment, where cybercrime poses as a significant threat and is an unauthorized access for valuable cultural media is a concern the preservation of assets had become paramount. Researchers are actively in exploring various technical solutions for protecting intellectual property rights and prevent unauthorized distribution or modification of these digital products.

Technological solutions like the digital rights management (DRM) systems and blockchain-based authentication method helps protect digital assets and prevent unauthorized use or distribution[36]. collaboration among governments, industry stakeholders as well as international organizations are essential for developing a coordinated strategy to combating digital piracy further ensuring the continued viability of IP protection in the digital era.

Blockchain technology which is renowned for its decentralized and secure architecture is playing a key role in revolutionizing the administration of intellectual property rights. Through blockchain-powered smart contracts, self-executing and transparent agreements are facilitated which enhances the effectiveness and tamper resistances of intellectual property transfers[37]. These had the potential to completely transform the management of intellectual property, even including how these licensing agreements and royalties are handled.

[36] Racheal Adams, 'The Evolution of Intellectual Property Rights in the Digital Age', Journal of Modern Law and Policy, 3, 52-63 (2023).

[37] Aragonda Moorthy & M. C. R. Dr. Karisiddappa Rao, 'Intellectual Property Rights of Electronic Information in the Age of Digital Convergence' (2001).

Fingerprinting Algorithms

Digital fingerprinting technology emerged as a dependable method to safeguard the privacy and copyright of digital assets against unauthorized distributions and accusatorial attacks. It also serve to monitor the usage and distribution of multimedia contents conveyed using cloud platforms[38]. When designing algorithms to generate fingerprinting codes, certain essential properties needs be considered, including robustness, uniqueness, compactness and unpredictability. These properties ensures the effectiveness and reliability of the fingerprinting processes. In fingerprinting algorithms, a set of features are extracted from the source contents which are then compared with database of known feature associated with copyrighted content[39]. If there are any sufficient matches among the source pattern and the library pattern they are considered to be identical.

4.2. Watermarking Algorithms

Watermarking refer to as the process of embedding data in multimedia elements like images, audio, or video files. The encoded data will the later be retrieved or detected from the multimedia for security purposes. Various approaches are used for assessing watermarking and non-watermarking algorithms, including precision, recognition, peak signal-to-noise ratio (PSNR), structural similarity index metric (SSIM), the normalized cross-correlation (NC), correlation coefficient (CC) and bit error rate (BER). PSNR, SSIM and NC which are commonly employed for estimating differences between the original image and the result after noise reduction or deformation. These metrics help measure the similarity in the original and watermarked images which indicates the robustness of the watermarking method in terms of invisibility. The unit of measurement used for these metrics is decibels (dB).

Recommendations

[38] Roya Ghafele & Benjamin Gibert, 'Crowdsourcing patent application review: leveraging new opportunities to capitalize on innovation?', MPRA Paper 38092, University Library of Munich, Germany (2011).

[39] Adebambo, 'Intellectual property rights protection in Sub-Saharan Africa', Journal of African Law, 62(1), 87-109 (2018).

Brown and Wilson[40] accentuated the significance of having transparent government regulations for managing intellectual property matters, which are often spanned in multiple countries. A regulatory framework which is open and adaptable is essential to facilitate cross-border enforcements. It is imperative for all regulations to take in account public feedbacks and are administered it consistently and fairly. The mechanisms for alternative dispute resolution needs be clearly outlined as well as explained for ensuring their effectiveness to avoid procedural law complexities[41].

In many countries, the absence of a well-established intellectual property rights (IPR) system necessitate collaboration with various stakeholders, private IPR specialists' groups for assisting in administration and enforcement [42]. Therefore, it remain imperious for focusing on capacity building of officials and institutions for fostering a favorable IP environment. The raising public awareness about IP issues and providing the necessary skills for identifying and supporting innovation which contribute to economic growth are crucial aspects[43]. The procedures and registration process for IP needs to be designed for meeting the need of creators/owner in terms of timeframe as well as simplicity. Clear procedures and processes will further enhance the effectiveness of the IP system and potentially encourage more IP registrations.

Ben[44] emphasised the crucial role awareness play among various stakeholders, including governments, private sector experts and the public for safeguarding intellectual property rights

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[40] D. Brown & E. F. Wilson, 'Copyright Enforcement in the Digital Age: An Analysis of the Digital Economy Act 2010', European Journal of Intellectual Property, 42(3), 287-309 (2018).

[41] Alan J. Cox & Kristina Sepetys, 'Intellectual Property Rights Protection in China: Trends in Litigation and Economic Damages', SSRN 1330619 (January 20, 2009).

[42] L. Lessig, Free Culture: How Big Media Uses Technology and the Law to Lock Down Culture and Control Creativity (Penguin, 2004).

[43] Y. Benkler, The wealth of networks: How social production transforms markets and freedom (Yale University Press, 2006).

[44] Ben Depoorter, 'Copyright Enforcement in the Digital Age: When the Remedy is the Wrong', UCLA Law Review, 66(4), 976-1026 (2019).

both locally as well as globally. They will be achieved via sharing of information and education with consumers as well. The global sharing of IP risks, including tactics employed by bad actors and best practices are essential. Understanding IP issues through public campaigns and other communication strategies is critical to promote awareness among the stakeholders.

Conclusion

The rise of digital technology had created significant challenges in protecting intellectual property. Intellectual property rights serves as crucial safeguards for human creativity, offering creator recognition and fair economic reward. These rights ensures works are be shared without fear of unauthorized copying or piracy. As the information become increasingly digitized is it important to ensure the public enjoys equal access of digital materials at the same time respecting IPR. Copyright concerns in the digital age are getting paramount and need prioritized practical approaches for maximizing benefits and progress. The invention of information and communication technologies revolutionized corporate activities making IPR an indispensable option to combat piracy of software and other IT products. Copyright protection needs to foster creativity rather than obstruct the use of information. From legislative frameworks used in case laws and technical solutions stakeholders needs to remain vigilant and adaptive towards managing the evolving challenges of digitalization. Moving forward, an approach which balance rights protection along with nurturing innovation and smooth access to knowledge is essential for utilising the full potential of intellectual property rights in the digital age.

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