



# PROTECTING INDIGENOUS KNOWLEDGE IN THE DIGITAL AGE AN ANALYSIS OF INTELLECTUAL PROPERTY RIGHTS, EMERGING TECHNOLOGIES, AND LEGAL CHALLENGES IN INDIA

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**Abstract:** Indigenous Knowledge, also known as Traditional Knowledge, refers to the shared knowledge, innovations, cultural practices and innovations which are accumulated by the native groups through generations. The knowledge contributes to biodiversity protection, traditional medicine, agriculture, environment sustainability and cultural legacy. However, the rapid growth of digital technology and Artificial Intelligence has increased the possibility of unauthorized access, biopiracy, digital appropriation and commercial exploitation of the Indigenous Knowledge without their consent. Intellectual Property Rules which primarily aimed at protecting individual creativity, often fail in recognizing the collaborative and intergenerational nature of indigenous knowledge. India has implemented various statutes to address the above issue such as Patents Act of 1970, the Biological Diversity Act of 2002 and the Geographical Indications of Goods Registration and Protection) Act of 1999.

The present study adopts a qualitative doctrinal research methodology to assess the effectiveness of India's legal framework in preserving Indigenous Knowledge in the digital world. Further, the study seeks to examine prominent international instruments, including the Convention on Biological Diversity (CBD), the Nagoya Protocol and various initiatives undertaken by World Intellectual Property Organization (WIPO). The findings of the study indicates that despite India's significant efforts to prevent biopiracy, the effective and sustainable preservation of Indigenous Knowledge depends on the enactment of a comprehensive legal framework integrating Artificial Intelligence (AI) governance, meaningful involvement of Indigenous communities and equitable benefit sharing mechanisms.

**Keywords:** Indigenous Knowledge, Traditional Knowledge, Intellectual Property Rights, Artificial Intelligence, Digital Technology, TKDL, Biopiracy.

## I. INTRODUCTION

Indigenous Knowledge, often referred as Traditional Knowledge, comprises of information, inventions, customs and abilities that have been accumulated by the indigenous groups over many generations of interaction with their environment. (Dutfield, 2004). This knowledge system encompasses traditional medicinal practices, agricultural systems, biodiversity management, folklore, handicrafts and cultural traditions. Indigenous Knowledge is collectively held by the communities, it is orally transmitted across generations and continuously evolves over time, in contrast to traditional scientific knowledge.

Recent advancements in technology have significantly transformed the approaches through which indigenous knowledge is preserved and shared. Technological advancements like digital repositories, cloud computing, online databases, blockchain technology and Artificial Intelligence (AI) have enabled governments, research institutions and international organizations to methodically archive and preserve important traditional knowledge (WIPO, 2022). The Traditional Knowledge Digital Library (TKDL) of India is one of the landmark initiatives that documents traditional medicinal knowledge in systematic manner and facilitates global access for patent examiners, thereby strengthening the protection of traditional knowledge against inappropriate patent claims. While digitization has enhanced the preservation of Indigenous Knowledge, it has simultaneously created new risks of misuse. Publicly available traditional knowledge may be reproduced, commercialized, utilized for training artificial intelligence systems or even patented without the prior informed consent of Indigenous communities (Correa, 2001).

Indigenous Knowledge is characterized by its collective ownership and intergenerational transmission and its close connection with cultural identity of Indigenous people. In contrast, the conventional intellectual property framework is largely drafted to protect originality, novel innovations and individual ownership. (Posey & Dutfield, 1996). Consequently, Indigenous community often remain unrecognized and fail to receive appropriate recognition or a fair share of the economic benefits derived from the commercial exploitation.

To tackle these concerns, the legislature of India has enacted several legislative safeguards, including the Patents Act, 1970, the Biological Diversity Act, 2002, the Geographical Indications of Goods (Registration and Protection) Act, 1999 and the Protection of Plant Varieties and Farmer's Rights Act, 2001. At the global level, international instruments such as the Convention on Biological Diversity (1992), the Nagoya Protocol (2010), and the United Nations Declaration on the Rights of Indigenous People (2007) reinforce the significance of preserving traditional knowledge and promoting fair and equitable benefit sharing. However, the rise of technology and the increasing digitization of the economy have revealed significant limitations in the current legal regime.

The present study provides a critical evaluation of India's intellectual property regime governing Indigenous Knowledge, analyzes the emerging legal challenges in the digital era and proposes recommendations for reform to achieve an effective balance between technological progress and the rights and interests of Indigenous communities.

## RESEARCH METHODOLOGY

The present study employs a qualitative doctrinal research methodology and is descriptive and analytical in nature. The study primarily relies on secondary sources to evaluate the legal framework governing the protection of Indigenous Knowledge in India and the challenges associated with emerging digital technologies.

Primary sources include the Patents Act, 1970, the Biological Diversity Act, 2002, the Geographical Indications of Goods (Registration and Protection) Act, 1999, the Protection of Plant Varieties and Farmer's Rights Act, 2001, and important international legal instruments such as Convention on Biological Diversity (CBD), the Nagoya Protocol, and the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP).

The secondary sources comprise scholarly books, peer-reviewed journal articles, reports published by WIPO, government publications, policy documents and relevant judicial decisions. A comparative legal analysis has been undertaken to examine the present legal framework and propose reforms to enhance the protection of Indigenous Knowledge in the digital era.

## INDIA'S INTELLECTUAL PROPERTY FRAMEWORK FOR PROTECTING INDIGENOUS KNOWLEDGE

India has developed a multi-layered legal framework to preserve Indigenous Knowledge. These laws help prevent biopiracy and illegal commercial use. However, these laws mainly offer defensive protection and fails to recognize Indigenous communities as collective owners of their knowledge (Dutfield, 2004).

Patents Act, 1970

The Patents Act, 1970 plays an important role in preserving traditional knowledge. Section 3(p) prevents patents from being granted for inventions that are based on existing traditional knowledge. As a result, it helps prevent biopiracy and the misappropriation of traditional knowledge. However, despite this protection, the

Act does not recognize Indigenous communities as the owners of their knowledge or provide them with compensations for its use (Correa, 2001).

Biological Diversity Act, 2002

The Biological Diversity Act, 2002 was enacted to fulfil India's commitments under the Convention on Biological Diversity (CBD). It regulates how biological resources and traditional knowledge can be accessed and used. The Act encourages fair sharing of the benefits through the Access and Benefit Sharing (ABS) mechanism. The Act established the National Biodiversity Authority, State Biodiversity Boards and Biodiversity Management Committees to regulate the resources and ensure its effective implementation. The Act requires prior approval for foreign access to biological resources. The Act also ensures that the Indigenous communities reserve a fair share of the benefits. The 2023 Amendment to the Act encourages research and investment while preserving benefit sharing safeguards.

## GEOGRAPHICAL INDICATIONS AND FARMER'S RIGHTS

The Geographical Indications of goods (Registration and Protection) Act, 1999 indirectly safeguards indigenous knowledge by protecting products whose distinctive characteristics and reputation are linked to a particular geographical region. Products such as Darjeeling Tea, Banarasi Sarees, Kanchipuram Silk, and Madhubani Paintings derive value from traditional skills and knowledge preserved by local communities over generations (The Geographical Indications of Goods (Registration and Protection) Act, 1999).

Similarly, the Protection of Plant Varieties and Farmers' Rights Act, 2001 recognizes farmers not only as cultivators but also as breeders and conservers of plant genetic resources. The Act seeks to balance breeders' rights with the traditional contributions of farming communities by acknowledging their role in biodiversity conservation and the preservation of agricultural knowledge (The Protection of Plant Varieties and Farmers' Rights Act, 2001).

Although these legislations collectively strengthen India's legal framework, they remain fragmented and do not fully recognize indigenous communities as the collective custodians of traditional knowledge.

### Landmark Cases Demonstrating the Need for Protection

Several landmark cases have exposed the limitations of conventional intellectual property laws in safeguarding indigenous knowledge and have significantly shaped India's response to biopiracy.

The Turmeric Patent Case involved a patent granted by the United States Patent and Trademark Office (USPTO) to the University of Mississippi Medical Center for the wound healing properties of turmeric. The Council of Scientific and Industrial Research (CSIR) successfully challenged the patent by providing that turmeric had been used in traditional medicine for centuries. Consequently, the patent was revoked on the ground that it lacked novelty (Correa, 2001).

Likewise, in the Neem Patent Case, the European Patent Office granted a patent relating to the antifungal properties of neem extracts to W.R. Grace & Co. and the United States Department of Agriculture. Indian scientists and environmental groups challenged the patent by presenting evidence of its long-standing traditional use, which ultimately resulted in its revocation (Dutfield, 2004).

The Basmati Rice Case further highlighted the importance of protecting traditional agricultural knowledge. RiceTec Inc. obtained patent claims concerning certain basmati rice varieties in the United States. Following objections raised by the Government of India, several of these claims were withdrawn, reinforcing the significance of geographical indications in protecting traditional products (Posey & Dutfield, 1996).

These cases collectively revealed major shortcomings in the international patent system and encouraged India to adopt stronger legal measures against biopiracy.

## TRADITIONAL KNOWLEDGE AND DIGITAL LIBRARY (TKDL)

India introduced Traditional Knowledge Digital Library (TKDL) in 2001 through the council of Scientific and Industrial Research (CSIR) and ministry of AYUSH to tackle the growing problem of biopiracy and unauthorized patenting of its traditional medicinal knowledge (WIPO, 2022). The database was created after several cases in which foreign entities attempted to patent knowledge that had long been part of India's traditional healthcare practices. TKDL documents medicinal formulation from ayurveda, Siddha, Unani, Sowa-Rigpa and Yoga and translates them into internationally recognized patent classification systems. This

enables patent examiners across the world to identify existing Traditional Knowledge as prior art, helping them reject patent applications that lack novelty. As a result, TKDL has become an effective defensive tool and has prevented the wrongful grant of numerous patents. Patent offices in countries such as United States, United Kingdom and the European Union have been given access to the database to support the patent examination process (WIPO,2022).

Despite its achievements, TKDL has certain limitations. Its primary focus is on documented medicinal knowledge, leaving many forms of traditional knowledge such as oral traditions, folklore, handicrafts and tribal ecological practices, and cultural expressions, outside its scope. Furthermore, while the database helps prevent the misappropriation of traditional knowledge through patents, it does not grant indigenous communities ownership rights or ensure that they receive economic benefits from the commercial use of their knowledge (Correa, 2001). Therefore, many scholars argue that the TKDL should be viewed as a complementary mechanism rather than a complete solution, emphasizing the need for a comprehensive sui generis legal framework that offers stronger legal protection and fair benefit-sharing for indigenous communities.

## **INDIGENOUS KNOWLEDGE IN DIGITAL AGE**

The digital age has made it easier to preserve and share indigenous knowledge through digital archives, online databases, artificial intelligence, and cloud technologies. These technologies help safeguard traditional medicinal knowledge, agricultural practices, biodiversity and cultural heritage while promoting research and education. However, once traditional knowledge is made publicly available online, it becomes vulnerable to unauthorized copying, misuse, and commercial exploitation, often without the knowledge or consent of indigenous communities (Correa, 2001).

The growing use of indigenous knowledge by pharmaceutical, biotechnology and cosmetic industries has increased its commercial value, yet the original knowledge holders rarely receive recognition or fair compensation (Dutfield, 2004). Therefore, stronger legal frameworks are needed to ensure prior informed consent, equitable benefit-sharing, and better digital governance. Emerging technologies such as blockchain may also help improve transparency and protect community rights.

## **ARTIFICIAL INTELLIGENCE AND INDIGENOUS KNOWLEDGE**

Artificial Intelligence (AI) increasingly relies on large datasets that often include publicly available indigenous knowledge, raising important legal and ethical concerns. Current Intellectual Property laws do not adequately regulate the use of traditional knowledge in AI training, allowing developers to use cultural and traditional resources without obtaining community consent or providing compensation. AI-generated outputs based on Ayurvedic knowledge or traditional art forms may also overlook the contributions of indigenous communities. Another reason is that AI may misrepresent or commercialize traditional knowledge by separating it from its cultural and spiritual context (Posey & Dutfield, 1996). Since neither Indian law nor most international legal frameworks specifically address this issue, there is a need for AI governance policies that ensure transparency, prior informed consent, proper attribution, and fair benefit-sharing whenever Indigenous Knowledge is used (United Nations, 2007).

## **INTERNATIONAL LEGAL FRAMEWORK FOR PROTECTING INDIGENOUS KNOWLEDGE**

Several international instruments recognize the importance of protecting Indigenous Knowledge. The Convention on Biological Diversity (CBD), 1992 encourages the conservation of traditional knowledge and promotes fair sharing of benefits arising from its use, while the Nagoya Protocol, 2010 requires prior informed consent and equitable benefit-sharing with indigenous communities (Convention on Biological Diversity, 1992; Nagoya Protocol, 2010). In addition, the World Intellectual Property Organization (WIPO) continues to work towards developing an international framework for the protection of traditional knowledge (WIPO, 2022).

The United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), 2007 further recognizes the rights of indigenous communities over their cultural heritage and traditional knowledge (United Nations, 2007). Although these international instruments have strengthened global recognition of Indigenous Knowledge, effective protection still depends on stronger domestic laws, international cooperation, and implementation at the national level.

## CONCLUSION AND RECOMMENDATIONS

The study highlights that while India has developed various mechanism such as TKDL, geographical indication and biodiversity regulation to protect indigenous knowledge, the existing intellectual property framework provide only limited and fragmented protection. Conventional IP laws are primarily based on individual ownership, novelty and limited- term rights. Whereas indigenous knowledge is collective and culturally embedded. Although TKDL has played an important role in preventing biopiracy by identifying traditional knowledge as prior art, it mainly offers defensive protection and does not ensure ownership rights or economic benefits for indigenous communities. Furthermore, digital technologies have created new opportunities for preservation and global recognition of indigenous knowledge but have also increased the risk of unauthorized access, commercialization, and cultural misappropriation.

To ensure effective protection of indigenous knowledge India should consider developing a sui generis legal framework that recognized community ownership provides long-term protection, and ensures fair benefit-sharing from commercial use. The scope of TKDL should be expanded by including diverse forms of traditional knowledge and involving indigenous communities in documentation and decision-making processes. Mechanisms such as prior informed consent, transparent licensing systems, and technological solutions like blockchain should be encouraged to strengthen protection in the digital era. Additionally, awareness programs should be conducted to educate indigenous communities about intellectual property rights and available legal remedies. Protecting Indigenous Knowledge is not merely an intellectual property concern but also a matter of cultural preservation, social justice, and sustainable development. A balanced approach combining legal reform, technological innovation, and community participation can ensure that Indigenous Knowledge is preserved and responsibly utilized for future generations.

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