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Back to the Future or Knowledge Reborn – AI Restoration, Traditional Knowledge Protection, and the Dilemma of Authenticity

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Abstract

This article explores the interplay between traditional knowledge (TK), artificial intelligence (AI), and the law, with a focus on challenges and opportunities in protecting TK. TK, often intrinsic to the way of life of Indigenous communities, faces threats of erosion, misappropriation, and neglect due to both modernisation and historical injustices. While digitisation and AI present promising tools for preserving and reconstructing lost TK, these technologies also raise concerns about authenticity and ownership.

AI can support TK preservation through techniques such as deep learning and data mining, which can reconstruct lost elements and provide tools for cultural revitalisation. To ensure cultural authenticity and alignment with communal values, AI-driven restoration necessitates collaboration with traditional communities. This raises complex questions about whether AI-restored TK qualifies as authentic and registrable under existing legal TK protection frameworks.

The article is divided into three sections, providing an overview and analysis of various legal aspects relating to the protection of TK in general and AI reconstructions of TK in particular. To this end, the article highlights the limitations of traditional intellectual property laws and rather focusses on national sui generis laws and the use of TK databases as a tool for protection. These sections are followed by a discussion, reflecting on the legal aspects in a wider cultural context, particularly proposing that authenticity should reflect the living community's values rather than rigid historical fidelity.

Keywords: Traditional Knowledge; AI restoration; Sui generis protection; Authenticity

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Introduction

This article addresses the meeting between old knowledge, new technology, and the law. Traditional knowledge (TK) is usually associated with knowledge from a distant past, orally transmitted between generations of Indigenous peoples and local communities. TK, however, exists in the present and it is subject to the same technological challenges and opportunities that affect other forms of knowledge. The possibilities of digitisation, digital storing, and online dissemination can help safeguard and revitalise TK, but it can also subject it to new forms of exploitation. Over the last decades, the role of TK in a digital media landscape has been discussed by the international community as well as by academics. Several studies have addressed questions such as the consequences of using digital databases to safeguard TK and TK's role in the new digital public domain (WIPO 2020: 10, Bhardwaj & Taparia 2020).

The latest addition to the possibilities offered by digital technology is Artificial Intelligence (AI). Its full impact on society still remains to be seen, but it is already having significant consequences for many social practices and sectors, including TK. The relation between TK and AI is a largely unchartered territory in academic research. This article is an attempt to contribute to this emerging field. As such, it does not present any firsthand empirical research on the practical uses of AI to restore TK, nor does it offer analyses of any legal cases concerning AI restored TK. This is largely due to the scarcity of such examples and cases. This article is rather an attempt to contextualise the relation between AI and TK within the general discussion about protecting TK that has taken place in academia and the international community over the decades. Thus, the aim of this article is to discuss the possibilities and consequences of using AI to reconstruct lost TK in relation to existing legal provisions for safeguarding TK, internationally and nationally.

Finally, the article goes on to address the question of authenticity and discusses if and how such use of AI can affect the authenticity of the TK that is being reconstructed. In doing this, it raises more critical considerations regarding the role and nature of authenticity. In this article, authenticity is to be understood as a sense of connection to a past: a concern that the process of safeguarding or reconstructing TK does not distort its original meaning or distance it from its original context. The question which is addressed in this discussion is how authenticity relates to originality and how this is affected by the realisation that TK also changes with the times and exists in a contemporary cultural context.

The article is divided into three sections, followed by a discussion. Chapters 2, 3, and 4 present an overview and analysis of various legal aspects relating to the protection of TK in general and AI reconstructions of TK in particular, while chapter 5 reflects on the legal aspects in a wider cultural context, paying special attention to the relation between authenticity and originality. The first section, chapter 2,

sets out by describing the problem: how different forms of TK are lost for various reasons, ranging from languages becoming extinct when no one uses them to traditional ecological or medical knowledge being lost in the process of modernity. Fundamentally, this is a threat not only to the global diversity of languages and knowledge systems, but also to the cultures that are constituted by those languages and knowledge systems. Chapter 2 also discusses potential solutions in the form of digitisation, including digital depositories to store and safeguard TK for the future, and the possibility to use AI to reconstruct knowledge that has been lost. While AI and digital technology can certainly contribute to preserving or reconstructing TK, they also present other risks in the sense that digital depositories can subject TK to exploitation and AI reconstructions raise questions regarding the nature and authenticity of the knowledge that is being reconstructed.

The second section, chapter 3, contextualises the question of AI and TK in a bigger discussion regarding the lack of legal tools to protect TK. While TK could be regarded as an immaterial asset, the existing modes of intellectual property (IP) rights are not well adapted to protect TK. This has raised questions regarding the possibility to protect TK under a *sui generis* regime in international law. Chapter 3 gives a brief overview of these, hitherto fruitless, endeavours, and how they relate to a strategy of protecting TK in databases that emerged around 2000.

Despite the failures to create an internationally binding treaty, several countries have taken proactive measures by implementing domestic *sui generis* protection for TK. The last section of this article, chapter 4, provides a brief overview of various national efforts aimed at enhancing protection for TK across different jurisdictions. It also zooms in on the question of how AI-reconstructed TK can be addressed legally in different countries: whether it might warrant protection as TK and if it could be included in different forms of TK registries.

Finally, chapter 5 provides a discussion where these legal considerations are related to the dilemma of authenticity: the question of whether AI-reconstructed TK is authentic in relation to is origin and to the community with which it is associated. This question will be discussed not only in relation to the law but in relation to a wider discussion about authenticity and heritage.

Traditional Knowledge (TK), AI Restoration, and Ownership

TK and Knowledge Loss

TK, also referred to as Indigenous knowledge or local knowledge, refers to knowledge systems embedded in the cultural traditions of regional, Indigenous, or local communities. As such, TK is a living body of knowledge that is not only

rooted in the culture of traditional communities but forms an integral part of their spiritual and cultural identity as well as their value systems, constituting a crucial element of their identity as a people (Chakrabarty & Kaur 2021: 405, Hossain & Ballardini 2021: 51-54, WIPO 2020: 13). TK is generally based on accumulations of empirical observation and on interaction with the environment. In many cases, it is sustained and passed on for generations as an oral tradition (Bhardwaj & Taparia 2020, Wekesa 2006: 2). It includes knowledge about traditional technologies, midwifery, ecological knowledge, traditional medicine, and craft skills and may find expression in stories, legends, folklore, rituals, or songs, transmitted through language, dance, games, design, visual art, and traditional architecture (WIPO 2020: 13, Chakrabarty & Kaur 2021: 405, Hossain & Ballardini 2021: 51, Sand 2003: 188).

Notably, TK lacks a singular, universally agreed-upon definition, reflecting its multifaceted nature and the plurality of perspectives surrounding it (Hossain and Ballardini 2021: 52). Nonetheless, there are many attempts by international organisations, like the International Council for Science (2002), to categorise TK. This engagement by international organisations is indicative of the increased acknowledgement of the importance of TK as a crucial element of the way of life of traditional communities. Today, it is recognised that TK, often enshrined in intangible cultural elements with spiritual essence relating to sanctity and sacredness, is intrinsic to the way of life of traditional communities (Chakrabarty & Kaur 2021: 404 and 417). As such, TK is distinctly connected to self-determination of traditional communities. As a consequence, the misappropriation or misuse of TK can be deeply offensive to the cultural values of communities and may infringe upon their interests, worldviews, and cultural rights (Chakrabarty & Kaur 2021: 404, Sand 2003: 189).

While the importance and cultural value of TK thus is acknowledged today, this certainly was not always the case. This, combined with a variety of complex circumstances, has led to the fact that TK is under constant threat not just of being misappropriated but also of being neglected or even forgotten. In fact, major parts of TK have already been lost over time. On the one hand, this can be attributed to modernisation, as traditional communities developed and adapted to modern lifestyles. Other factors, however, may include that TK, including language, is not consistently used and therefore certain elements, like specific expressions, or whole bodies of knowledge may simply be forgotten. Another, more sinister cause of TK loss is Western colonisation, exemplified by the forced removal of Indigenous children in Canada and the U.S. to boarding schools where their traditional culture was violently suppressed (Pember 2019).

This loss of knowledge cannot be completely avoided, with 90% of the around 6 000 languages currently spoken facing extinction, detrimentally impacting their

associated cultural identities (Chakrabarty & Kaur 2021: 419, Chandran 2017). As TK is commonly transmitted orally through these languages, this will likely lead to a further loss of the knowledge they carry. That the already significantly diminished TK is primarily preserved by the elders of traditional communities further underscores the urgent need for its protection. A potential approach to the preservation of TK is to enhance the understanding of its value among younger generations, thereby fostering incentives for its protection from within the traditional communities themselves (Chakrabarty & Kaur 2021: 422). Such an approach seems to align with the broader objective of 'cultural sustainability,' which emphasises the importance of local adaptation and the community's capacity to maintain and evolve their cultural practices and knowledge systems in response to changing circumstances (Järvelä 2023: 4-5).

AI Restoration of TK

A major challenge in preserving TK lies in the substantial portions that have already been lost, along with the fragmentation of what remains, making holistic preservation difficult as key aspects of its original context and meaning may be irretrievably diminished. Rather than analysing the causes of this loss, the following section assumes its occurrence and focuses on how AI can support TK preservation and potentially aid in restoring lost elements.

According to Rahmatian (2010), restoration of cultural objects can be broadly categorised into six types of restorative efforts. The first category concerns the preservation and protection from (further) decay. The second type focusses on adding missing parts while maintaining the integrity of the existing elements. The third category addresses the reconstruction of the original whole by using existing fragments. The fourth type deviates slightly, focusing on creative restoration that forms a (new) whole in the spirit and style of the lost or fragmented object. The fifth category involves creating a new work inspired by the spirit or style of an artist or era. The sixth type of restoration concerns transformative use of pre-existing works (Rahmatian 2010: 53).

Given the specific challenges of TK, types five and six seem less relevant for restoring lost knowledge. While type four may serve a valid purpose, its creative input risks deviating from the authenticity of the original. By contrast, types one, two, and three prioritise preserving existing knowledge and recovering lost elements in alignment with the essence and spirit of the original object. As such, they appear to represent appropriate approaches for the restoration of lost TK.

If carried out solely by human restorers, restorative efforts require substantial time and human resources. Given that the knowledge necessary for filling gaps in alignment with the original's spirit is often held by the elderly within traditional communities, time becomes a critical and increasingly limited factor.

This is where digitisation and AI can play a transformative role. To address the need for preservation and prevent further loss, endangered TK can be digitised, preventing further decay and thereby preserving it for future generations. This digitised knowledge can then serve a dual purpose. The first is educating younger generations about their cultural heritage and TK, equipping them to assess the authenticity and spirit of restored knowledge. The second purpose lies in training AI systems to support the preservation and restoration of (lost) TK.

A key benefit of AI restoration is its ability to fill gaps by reproducing missing elements, enabling younger generations to better appreciate and connect with their cultural heritage (Li 2022: 368, Georgopoulos 2018: 1). Deep learning (DL) is one of the most effective AI tools for this task, as its algorithms analyse vast amounts of data and generate accurate reconstructions of missing elements. DL uses neural networks to process data and make decisions by identifying patterns and solving complex tasks, mimicking human reasoning to classify information and apply insights in various fields, like image recognition and natural language processing (DeepAI n.d.). Furthermore, DL enables computers to learn and apply hierarchical concepts, making it particularly well-suited for the restoration of cultural objects, including the reconstruction of TK by filling gaps and restoring incomplete elements (Goodfellow et al. 2016: 1). These AI algorithms can be supplemented by Text and Data Mining (TDM), a technique that extracts patterns from large datasets, to enhance the understanding of the restored TK. While DL plays a pivotal role in reconstructing damaged or incomplete elements, TDM can further uncover underlying structures and relationships within the knowledge, offering additional insights that complement AI-driven restoration efforts (Li 2022: 379).

One of the main concerns with AI-restored cultural heritage is whether restored knowledge can be considered authentic. In other words, it can be questioned whether AI can fill gaps in alignment with the original spirit (Li 2022: 374). In this respect, it is essential to recognise that AI restoration cannot function on its own. Instead, effective restoration necessitates AI and human collaboration. This is particularly relevant in the context of restoring TK. The main objective is to ensure that AI-restored knowledge remains authentic. There is a clear distinction between human interpretation and scientific (AI) interpretation, as the latter is entirely shaped by algorithms trained on specific datasets (Li 2022: 370-372, Boffey 2021). Consequently, AI can only generate assumptions derived from the patterns and information present in its training data. Once an AI system is trained, its operations and decision-making processes become largely opaque, so that its response cannot be reliably anticipated by human observers (Li 2022: 372-374, Gaskin 2021, Marcus & Davis 2019: 190).

Thus, while AI can generate multiple outputs, each slightly different, human intervention is required for determining which output is most accurate or in guiding

the AI towards further refinement (Castillo 2021). As such, human intervention is crucial for ensuring that the essence of the original is not lost (Li 2022: 374), or, in the current context, that AI output reflects the spirit of the TK accurately. Effective restoration of TK thus requires active community participation, as the insights of traditional communities are essential for verifying the authenticity of AI-generated reproductions. In this respect, educating younger generations is vital to preserving the remaining knowledge, ensuring its continued availability within traditional communities, both to enrich their cultural heritage and to facilitate restoration efforts in the future.

AI-driven applications should uphold and advance human rights. By aiding in the restoration of TK and lost cultural heritage, AI algorithms can contribute meaningfully to the preservation of the rights of traditional communities (Li 2022: 374). However, this potential can only be realised if AI is applied responsibly and ethically, while respecting the communities' priorities and cultural values. Positive TK protection measures, such as restoration efforts and documentation, can help preserve TK while potentially providing tangible benefits to communities, including compensation or cultural revitalisation (Chakrabarty & Kaur 2021: 419). AI can further improve such efforts, ensuring cultural heritage remains accessible for future generations. Digitisation and using AI to restore TK transforms cultural heritage into digital data, which becomes more accessible and thereby more vulnerable to misuse. This exposes the knowledge to potential appropriation, necessitating protective measures to ensure that sensitive cultural data is not exploited without proper consent or oversight from the originating communities (Chakrabarty & Kaur 2021: 420).

TK Ownership and Protection

Ownership is a critical consideration when it comes to protecting TK. As an intangible asset, TK is often examined through the lens of IP rights. However, TK ownership significantly differs from conventional IP frameworks. Existing IP doctrines would likely classify TK as part of the public domain, a perspective that is contested by traditional communities, who argue that such classification leaves TK vulnerable to unauthorised use and misappropriation (WIPO 2020: 10, Bhardwaj & Taparia 2020).

Furthermore, new challenges emerge in the context of technological development and digitisation, particularly regarding their impact on access to cultural heritage. While these technologies can improve the accessibility and use of TK for the benefit of the traditional communities that hold it, they also significantly increase the risk of misappropriation (Tuominen et al. 2023: 196). As such, information technology has fundamentally altered how TK is exploited. Particularly when digital cultural heritage materials are freely available online, the

communities from which they originate often lose meaningful control over their distribution and use (Tuominen et al. 2023: 200, Chisa & Hoskins 2016: 1-2).

TK ownership, however, should directly benefit the traditional communities that develop, sustain, and culturally identify with this knowledge (WIPO 2020: 20). The purpose should thus encompass goals like conservation and preservation, fostering economic empowerment, ensuring equitable benefit-sharing, safeguarding TK from misappropriation, protecting tradition-based innovation, and promoting respect for traditional communities, including preventing culturally offensive uses (WIPO 2020: 26, Chandran 2017: 2, Wekesa 2006: 7-9). In this respect, the use of TK from traditional communities should only be permissible based on prior, free, and informed consent (Chakrabarty & Kaur 2021: 417).

When comparing Indigenous and Western concepts of rights, terms such as access, public availability, and public domain carry fundamentally different meanings. Even if TK could be prevented from falling into the public domain, Western IP standards are inadequate for its protection, as they fundamentally conflict with Indigenous worldviews (Tuominen et al. 2023: 197-199). Several key differences underscore this incompatibility. Unlike IP, which is limited in duration, TK requires ongoing protection to reflect its generational nature (Hossain & Ballardini 2021: 57, Bhardwaj & Taparia 2020, Kalaskar 2012: 1). Additionally, TK is deeply integrated into cultural heritage, which, for Indigenous communities, cannot be owned by a single individual, and the concept of private property rights over knowledge is not aligned with their cultural values (WIPO 2023: 1, Chisa & Hoskins 2016: 3). Thus, whereas Western IP law rejects community ownership and emphasises individual ownership, TK is inherently collective, demanding a community rights-based approach (Hossain & Ballardini 2021: 58, Chakrabarty & Kaur 2021: 418). Moreover, for Indigenous populations, the focus is not on exclusive rights or restricting access but on achieving self-determination and sustaining the existence and development of TK (Tuominen et al. 2023: 198, Chisa & Hoskins 2016: 3). Most significantly, TK protection should extend beyond legal or economic considerations, encompassing inherently spiritual dimensions (Chisa & Hoskins 2016: 2).

TK lies at the heart of Indigenous cultures, forming an essential part of their way of life. In this sense, TK rights are intrinsically linked to cultural rights, safeguarded within the framework of human rights law, which frequently affirms that traditional communities should maintain control over their TK, particularly when it holds profound cultural significance. These frameworks provide for both moral rights, recognising TK as a cultural commons, and protection for material interests (Hossain & Ballardini 2021: 60). For instance, Article 31 of the UN Declaration on the Rights of Indigenous Peoples (UNDRIP) explicitly recognises the right of Indigenous communities "to maintain, control, protect and develop

cultural heritage, traditional knowledge, and traditional cultural expressions".

Notably, as a mere declaration, UNDRIP is not a legally binding document (Hossain & Ballardini 2021: 61). In the binding bill of rights, TK is neither explicitly addressed in the International Covenant on Economic, Social and Cultural Rights (ICESCR) nor in the International Covenant on Civil and Political Rights (ICCPR), which were developed during a period when human rights were primarily conceptualised as individual rights. However, both acknowledge a collective dimension to certain rights, such as the enjoyment of cultural rights by an individual in community with other members of their group (HRC 1994: para. 6.2, Hossain & Ballardini 2021: 61). In this context, Article 27 ICCPR can be interpreted to implicitly encompass TK as part of the right of minorities to enjoy their culture, religion, and language.

This suggestion aligns with the interpretation of cultural rights by both the Human Rights Committee (HRC) and the Committee on Economic, Social and Cultural Rights (CESCR). For instance, HRC General Comment No. 23 acknowledges that Article 27 encompasses the rights of Indigenous Peoples to their way of life, including engagement in traditional activities (HRC 1994: paras. 3.2 and 7). These traditional activities are often deeply rooted in the TK of these communities (Hossain & Ballardini 2021: 62). CESCR General Comment No. 17 goes even further, explicitly recognising TK in relation to Art. 15(c) ICESCR on the right to benefit from the protection of the moral and material interests resulting from any scientific, literary, or artistic production of which one is the author. The comment highlights that state parties should "ensure the effective protection of the interests of Indigenous peoples relating to their productions, which are often expressions of their cultural heritage and traditional knowledge" (CESCR 2006: para. 32). Reaffirming and expanding upon this, CESCR General Comment No. 25 recommends that, for the effective protection of TK, states should adopt various measures, including establishing specialised IP regimes and ensuring that traditional communities and Indigenous peoples retain ownership and control over their TK (CESCR 2020: para. 39). Notably, despite this increasing recognition of Indigenous cultural rights in soft law and interpretative guidelines, the realisation of such human rights is often undermined by their insufficient transposition into concrete and enforceable national legal frameworks (Mokodompit et al. 2023: 130 and 133-134).

Ultimately, the CESCR returns the issue back to the domain of IP rights, where in fact most TK protection laws are established in the form of *sui generis* IP rights. *Sui generis* IP rights, derived from the Latin meaning 'of a special kind,' refer to a special legal protection system, designed to address issues that do not fall into either of the traditional IP categories. For the unique characteristics of TK, this offers a system that can address its specific needs and protection requirements,

while still remaining within the broader scope of the IP framework (WIPO 2020: 36, Kalaskar 2012: 2, Wekesa 2006: 3).

Sui generis TK protection laws typically offer one or both of two types of protection: defensive protection and positive protection. Defensive protection does not grant TK holders specific rights over their knowledge; rather, it safeguards against misappropriation (Ganesan 2016: 50). This is achieved by preventing individuals outside traditional communities from obtaining IP rights over TK (WIPO 2023: 2). For instance, the inclusion of knowledge in databases can help identify TK as prior art, thus preventing patents based on TK from being granted to non-traditional inventors (Ganesan 2016: 52). Another notable benefit is that undisclosed TK stored in private databases may be eligible for trade secret protection (Hossain & Ballardini 2021: 57). Positive protection, in contrast, involves the granting of rights that enable communities to promote, control, and benefit from the commercial exploitation of their TK (WIPO 2023: 2). This can be facilitated, for example, through licensing agreements and benefit-sharing mechanisms (Ganesan 2016: 53).

If TK is effectively protected against misappropriation and may potentially even offer tangible benefits to traditional communities, these communities may be more inclined to share their knowledge, such as medical insights, which can, in turn, benefit the global community (Wekesa 2006: 9). In this regard, proper TK protection can create a mutually beneficial situation for both local communities and broader society. However, the question is whether a *sui generis* system can in fact provide effective protection for TK. In a global economy driven by IP rights, it remains to be seen whether *sui generis* TK protection can effectively challenge this dominance, particularly given the disparity between weaker national TK laws and the overwhelming strength of the international IP regime (GRAIN 1998). Furthermore, since *sui generis* TK protection is based on IP rights, it may suffer from similar shortcomings inherent in the traditional IP system (Chisa & Hoskins 2016: 6). In fact, critics argue that *sui generis* rights are incapable of offering a sufficient solution (Hossain & Ballardini 2021: 53).

Protecting TK in International Law, from *Sui Generis* Rights to TK Databases

Sui Generis Rights

The first initiative to protect TK in international law was developed within the field of copyright. The 1967 Stockholm conference of the parties to the *Berne Convention for the Protection of Literary and Artistic Works* wanted to adapt international copyright to a new postcolonial landscape by addressing issues of particular

importance for the global south. One such issue was the protection of folklore and TK, which had hitherto been ignored by a copyright regime based on the idea of the author as an individual creator rooted in European history and influenced by liberal ideology and romantic aesthetics (Boyle 1996). In an attempt to embrace non-Western forms of creativity, the 1967 revision of the Berne Convention came to include Article 15(4)a, allowing member states to protect unpublished works by anonymous authors – although without explicit references to folklore or TK (Blake 2015, Hemmungs Wirtén 2010). This, however, had limited impact since it was only an optional provision and thus not an internationally binding legislation.

Nine years later, UNESCO presented its 1976 Tunis Model Law on Copyright for Developing countries: a template for copyright legislation that developing countries could utilise to help them adopt national copyright acts that meet the requirements in the 1952 Universal Copyright Convention. Article 6 of this model law provided protection for folklore in a more explicit manner than the Berne Convention. Nevertheless, since a model law is a voluntary and flexible tool that states can apply in the form and to the extent they see fit, the Tunis Model Law also failed to provide for any significant harmonisation of TK protection in international law (Sand 2003).

In the 1970s, UNESCO and WIPO began exploring the possibility of protecting TK and folklore without relying on existing IP legislation. This resulted in the passing of another model law: the Model Provisions for National Laws on the Protections for Expressions of Folklore against Illicit and Other Prejudicial Actions in 1982. This was a template for a *sui generis* protection of folklore and TK that individual states could adopt at their own discretion. Similar model laws have also been promoted regionally, for instance by the African Union and the Pacific Community (Sand 2003, Clark et al. 2004). Two years later, UNESCO and WIPO presented a draft for an international Treaty for the Protection of the Expressions of Folklore Against the Illicit Exploitation and Other Prejudicial Actions. Such a treaty would have been the first international, legally obliging *sui generis* protection for TK, but it was rejected, primarily by the industrialised member states (Blake 2015: 247).

Following this setback, UNESCO and WIPO came to address the issue on separate fronts. UNESCO continued the work on its own, leading up to the UNESCO Recommendation on the Safeguarding of Traditional Culture and Folklore of 1989. This was, again, not a legally binding treaty but merely a document that outlined a model for a *sui generis* protection for TK that the member countries were encouraged to adopt (Perlman 2011, Blake 2015). This would, as Blake puts it, be a system where "the creators and interpreters of folklore would be treated in a manner equivalent to that of copyright-holders", but without utilising existing IP legislation (Blake 2015: 248).

In 2001, WIPO appointed a special committee to address the issue, the Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore (IGC). One of the ultimate goals of the IGC was to develop an international treaty to protect genetic resources, TK and folklore (Blake 2015: 259). By 2015, the IGC had produced two draft provisions for a future legislation: the WIPO Revised Provision for Protecting Traditional Cultural Expressions and the WIPO Draft Articles of the Protection of Traditional Knowledge (Blake 2015). The latter of these documents included provisions to prevent the granting of illegitimate patents on TK and associated genetic resources (Blake 2015: 267). In 2024, WIPO adopted the Treaty on Intellectual Property, Genetic Resources and Associated Traditional Knowledge. The treaty aims to prevent illicit patenting of Indigenous knowledge by requiring patent applications to disclose their sources of knowledge and get the consent of the source communities before patenting and commercialising their knowledge (WIPO 2024). At the time of writing, the treaty has not yet entered into force but will do so if and when it is ratified by 15 signatories.

The illicit patenting of genetic resources and associated TK has also been addressed by the Convention of Biological Diversity (CBD) and the Nagoya Protocol, which provides provisions similar to the 2024 WIPO treaty. While the overarching goal of the CBD is to prevent the erosion of biological diversity, Article 1 in the CBD also calls for a "fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies" (CBD Article 1). This is further elaborated in the 2014 Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS) to the Convention on Biological Diversity. The Nagoya Protocol introduces instruments that can be employed to ensure that Indigenous Local Communities (ILCs) are involved in and benefit from the exploitation of resources emanating from their TK about local genetic resources (although without explicitly mentioning patents as a specific form of exploitation). The CBD and the Nagoya Protocol take a narrower approach to the issue of TK than WIPO and UNESCO as they only address TK associated with genetic resources. The Nagoya Protocol is nevertheless one of the few international agreements that oblige the member states to acknowledge traditional and local communities' rights to TK (Fredriksson 2020, Daly 2015).

Apparently, the attempts to establish protection for TK have, so far, resulted in few legally binding instruments but a number of recommendations to member countries to protect TK in national legislation. It is hardly surprising that it is mostly countries of the Global South that have adopted different forms of TK protection in their domestic legislation. The work of WIPO has instead come to focus more upon the possibility of database protection for TK.

TK Databases

In parallel to the negotiations over a *sui generis* protection for TK, WIPO and the IGC have addressed the possibilities to construct TK databases as a means to protect that knowledge from misappropriation. As mentioned before, there are, broadly speaking, two kinds of protective databases: 'defensive' protection and 'positive' protection (Varadarajan 2011). This chapter will primarily deal with defensive databases, as these have come to dominate the discussions at WIPO. During the first session of the IGC in May 2001, the member states articulated a need for a defensive protection in the form of documentation of TK that can prevent the illegitimate patenting of such knowledge (WIPO/GRTKF/IC/2/6, §1). Since the IGC was formed, it has regularly discussed different approaches, based on various forms of defensive databases for protecting TK.

Two databases that are often evoked as successful examples by the IGC are India's *Traditional Knowledge Digital Library* (TKDL) and the American Tulalip Tribe's TK database *StoryBase*. The TKDL is a state-run digital archive that collects and catalogues information on practices and pharmaceutical formulas originating from the four main branches of traditional Indian medicine – Ayurveda, Yoga, Unani, and Siddha. The library was launched in 2001 in response to cases where TK from India had been patented by companies in America or Europe, much to the outrage of Indian authorities and of the original holders of that knowledge. The idea behind the TKDL is to collect and classify a vast amount of TK in a format that is accessible and easily searchable for foreign patent examiners to make that information visible as prior art and thereby prevent its future patenting. Thus, the TKDL is only accessible to patent examiners at patent offices that have signed a non-disclosure agreement with India's Council of Scientific and Industrial Research (CSIR), the government institute that owns the database (Reddy & Chandrashekaran 2017, Gupta 2000, 2001, Fredriksson 2021).

StoryBase, on the other hand, is constructed and managed by the Tulalip Tribes, a First Nations community in Washington state. StoryBase was founded around the same time as the TKDL but stores traditional ecological knowledge: knowledge on how to manage and interact with the local environment that has been produced and reproduced within the Tulalip community for generations. StoryBase is an initiative by a small local community to register and store their own TK, primarily intended for internal use by the community. Such databases are sometimes described as internal databases, in contrast to external databases like the TKDL where authorities or other non-Indigenous actors take it upon themselves to collect and safeguard knowledge from local communities (UNEP/CBD/WG8J/4/INF/9).

To manage the disclosure of information, StoryBase makes a distinction between 'Type A knowledge' that is only available to members of the community, and 'Type B knowledge' which is made available to people outside the community,

such as patent examiners. In that way, information that is not already public can be documented for preservation for future generations without being disclosed, while information that has been made public can be documented for the purpose of preventing misappropriation (WIPO/GRTKF/IC/7/7, WIPO/GRTKF/IC/8/7). In that regard, StoryBase is both a positive and a defensive protection (WIPO/GRTKF/IC//3/6), compared to the TKDL which is a predominantly defensive database.

The question of whether to disclose information depends on what kind of material is documented. In the case of the TKDL, the database mostly contains so-called *codified TK* which is already documented and publicly available. StoryBase, on the other hand, mostly contains *uncodified TK* that has been passed on orally from generation to generation. A representative of the Tulalip Tribes at the WIPO proceedings also highlighted the diversity of different forms of knowledge including well-established and state-supported traditional medical practices such as Ayurveda and more local and marginalised forms of TK "which have not had schools to teach these things for thousands of years" (WIPO/GRTKF/IC/12/9, § 201).

Even though StoryBase is often highlighted as a good example in the WIPO debates, neither the Tulalip Tribes nor representatives of Indigenous communities in general uncritically embrace the idea of databases. While they acknowledge that databases can provide some protection against exploitation and preserve knowledge for future generations, they also feel that misused or badly managed databases can subject TK to public exposure and potential exploitation. The efficiency of defensive databases is sometimes questioned. Bagley (2019), for instance, argues that a database does not provide "any additional protection from misuse that the traditional knowledge does not already have, it is simply making the knowledge more easily accessible". He goes on to argue that "the database is not even providing that dubious level of 'protection' to secret traditional knowledge, as it cannot be used in a rejection without voiding its secret status" (Bagley 2019: 340). Furthermore, there are concerns that an exclusive focus on databases for protection can divert attention from other more effective, but also more controversial, strategies such as a *sui generis* protection of TK (WIPO/GRTKF/IC/29/8, Biswajit 2017: 257, Fredriksson 2022).

National TK laws: Registration and AI-Restored Knowledge

National Sui Generis TK laws

Despite ongoing efforts and debates surrounding the *sui generis* protection of TK, no internationally binding treaty has yet been established to address this issue comprehensively. However, a growing number of countries have taken steps towards

protecting TK by implementing domestic *sui generis* laws, reflecting a growing recognition of the need to safeguard cultural heritage through tailored national legislation. These countries include Costa Rica, Brazil, India, Kenya, Malaysia, Panama, Peru, South Africa, the Philippines, Thailand, and Venezuela (Chakrabarty & Kaur 2021: 410, Tong 2019: 935, Ganesan 2016: 53, Wekesa 2006: 10, Clark et al. 2004: 763-766). Some of the essential elements of *sui generis* TK protection laws include provisions for benefit-sharing, prior informed consent (PIC), and the disclosure of the country of origin. Further crucial elements concern co-ownership of patents, the disclosure of the use of TK, and regulations for contractual agreements that acknowledge the role of customary law (Kalaskar 2012: 4).

Peru was among the first countries to formally integrate domestic TK protection through its enactment of Law 27811 (UNCTAD 2016, Clark et al. 2004: 758 and 773). This law "introduces a notion of guardianship that emphasizes the responsibility of current Indigenous generations to preserve, develop, and administer their knowledge for their own benefit and for the benefit of future generations" (Clark et al. 2004: 778). Law 27811 provides targeted protection for the collective TK of Indigenous peoples, specifically in relation to biological resources, rather than offering a general TK protection framework (Clark et al. 2004: 775). It establishes that TK cannot be individually owned but must be collectively exercised by Indigenous communities, who are, however, entitled to determine their own priorities (Ganesan 2016: 53). The law envisions royalty payments for the use of TK and utilises existing legal instruments such as registers, licenses, trade secret protection, and competition law to enforce these rights (Chakrabarty & Kaur 2021: 412, Ganesan 2016: 54, Clark et al. 2004: 773).

In this context, registers offer defensive protection by preventing misappropriation, while licenses can provide positive protection that can benefit traditional communities by offering fair compensation (Clark et al. 2004: 782). However, the Peruvian system has also been criticised for not fully realising its potential benefits (UNCTAD 2016). As noted by Hossain and Ballardini, traditional communities may not view registration as the most effective method for protecting their TK, as this may conflict with their cultural values and practices (2021: 59).

Costa Rica enshrines the protection of TK in its Biodiversity Law, Law 7788, where Article 82 establishes TK as a *sui generis* form of IP. A distinctive feature of this provision is that it does not require prior declaration, explicit recognition, or official registration, allowing for the inclusion of practices that may acquire TK status in the future (Wekesa 2006: 10, Clark et al. 2004: 764). The law further determines that traditional IP rights cannot conflict with TK protection, seemingly prioritising TK. While the exact scope of these rights is to be defined through secondary legislation, a participatory process is envisioned to determine who can hold and invoke these rights (Clark et al. 2004: 764). The Costa Rican government

often relies on prospecting agreements to enforce TK rights against international corporations. However, these agreements have also included TK held by Indigenous communities without involving them in the negotiation process, raising concerns about inclusivity and representation (Ganesan 2016: 53).

In contrast to this, Brazil's approach to TK protection, like Peru's, mandates the registration of TK as a prerequisite for legal recognition. Unlike Costa Rica, however, Brazil's law, Medida Provisória No. 2. 186-16 of 2001, specifies that TK protection does not affect conflicting IP rights established prior to the TK registration (Clark et al. 2004: 763). On a positive note, the Brazilian law explicitly identifies and guarantees TK holder rights with a specific chapter dedicated to benefit sharing and licensing agreements (Ganesan 2016: 53). This approach offers a form of positive protection, ensuring that TK holders are actively involved in the utilisation and economic benefit derived from their knowledge. Similarly, Malaysia, Kenya, and Panama offer positive protection for TK, with at least Panama requiring the registration of TK as a condition for such protection (Chakrabarty & Kaur 2021: 410, Clark et al. 2004: 766). India, by contrast, also mandates the registration of TK as a prerequisite but provides only defensive protection, as outlined above (Chakrabarty & Kaur 2021: 410).

One of the most recent examples of domestic TK protection is found in South Africa's Protection, Promotion, Development and Management of Indigenous Knowledge Act of 2019 (PPDMIKA), adopted at the brink of the Fourth Industrial Revolution, which is defined by rapid digitisation and data flows. The Act's objectives address a variety of aspects inherent to TK, including protection from "unauthorized use, misappropriation, and misuse", promoting its wider application and development, and ensuring equitable benefit-sharing, while at the same time encouraging the commercial utilisation of TK including for new products, services, and processes. To prevent misappropriation, TK shall also be recognised as prior art in the context of IP rights (PPDMIKA: Section 3). Indigenous communities are then granted exclusive rights to: (a) any benefits derived from the commercial use of their TK, (b) recognition as the origin of the TK, and (c) restrict unauthorised use of their knowledge (PPDMIKA: Section 13(1)). In this respect, individuals outside the community intending to use TK commercially must negotiate a licensing agreement with a trustee representing the Indigenous community (PPDMIKA: Section 13(2), Tong 2019: 935).

To be protected under the PPDMIKA, TK must be registered and documented in accordance with Section 3(f), Section 9, and Chapter 6 of the Act. For this purpose, a suitably skilled and qualified person shall be appointed as curator of such knowledge. The curator may then delegate their powers to a trustee of Indigenous communities (PPDMIKA: Section 18). Section 19 further details the specifics of the register, its contents, and a stipulation regarding the security of the register. Regarding security, it is noteworthy that the register is generally public, allowing

public access for inspection subject to payment of a fee (PPDMIKA: Section 21(1)). However, for certain additional documents related to the registration of TK, access may require the requesting party to enter into a non-disclosure agreement (PPDMIKA: Section 21(2)). Section 20 of the PPDMIKA then outlines the conditions for registration, notably referring the registrability of TK to certain specific criteria outlined in Section 11 of the Act (PPDMIKA: Section 20(2)).

In this context, Section 11 prescribes that the protection of TK only applies to such knowledge that "(a) has been passed on from generation to generation within an Indigenous community; (b) has been developed within an Indigenous community; and (c) is associated with the cultural and social identity of that Indigenous community" (PPDMIKA: Section 11). Notably, Section 10 explicitly states that TK is protected only as long as it meets these eligibility criteria. Once knowledge no longer satisfies these criteria, it falls into the public domain (PPDMIKA: Section 10). Thus, for South Africa, TK refers only to knowledge that has been developed within an Indigenous community, is deeply connected to its cultural and social identity, and is passed down through generations. While this generational aspect aligns with Indigenous worldviews, it also raises questions about what constitutes TK, both in relation to the objective of developing TK as outlined in PPDMIKA Section 3(b) and whether lost knowledge and cultural heritage restored through AI can qualify as TK.

At this point, it is important to highlight that national TK protection laws are significantly limited, primarily because they only provide protection within the confines of specific national jurisdictions (Clark et al. 2004: 775). This fragmented protection, however, is insufficient in addressing the globalised nature of knowledge exchange, as it fails to ensure comprehensive custodianship and equitable benefit-sharing on a broader scale (Intepat 2020). The misappropriation of TK is a global problem (Chakrabarty & Kaur 2021: 407). This holds especially true in relation to other IP rights that benefit from robust international protection. While national laws can help prevent misuse of TK nationally, they are inherently constrained by those jurisdictional boundaries, requiring the establishment of internationally agreed-upon rules to provide global recognition and enforcement of TK protection (Kalaskar 2012: 1, Clark et al. 2004: 795).

The Registration Requirement and AI-Restored TK

According to Clark et al. (2004: 782-784), TK registers are designed to protect the rights of Indigenous communities by helping preserve their knowledge, ensuring control over its use, and preventing unauthorised use and misappropriation. There are three main types of registers: Public National Registers, Confidential National Registers, and Local Registers. Public National Registers compile publicly available TK, for example, to assist patent offices in evaluating patent applications

involving Indigenous knowledge. Confidential National Registers safeguard TK that Indigenous communities seek to keep secret. Access to these registers is therefore restricted. Local Registers support community-level initiatives to manage and control access to TK based on local customs or laws.

A key issue with documenting TK in official registers is that it results in wide disclosure, making such knowledge more accessible to the public, especially when made available online. This raises further concerns regarding misappropriation, particularly when only national protection exists. On the other hand, documentation, at least under current *sui generis* regimes, is essential for the protection of TK, as it helps define what knowledge is protected while also preserving it for future generations (WIPO 2023: 2, Bhardwaj & Taparia 2020, Chisa & Hoskins 2016: 4). A potential solution, applied both by the TKDL and *StoryBase*, could be to store documented TK in private registers, limiting access on a need-to-know basis (Kalaskar 2012: 2). At least with regard to defensive protection, this seems to be an adequate approach (Ganesan 2016: 50). Even for positive protection, this approach may still be suitable, allowing traditional communities to exercise self-determination in deciding when, with whom, and for what purposes their knowledge is shared (Kalaskar 2012: 2-3). In this context, a significant challenge with TK databases is that they are, like the TKDL, often governed by the state rather than being under the primary authority of traditional communities (Tuominen et al. 2023: 205).

When it comes to registering TK, a distinction can be suggested between registers used for defensive protection and those for positive protection of TK. In the context of defensive protection, particularly with regard to patents, an unequivocal identification of knowledge as TK is less critical. As long as the knowledge exists anywhere in the world, irrespective of whether it belongs to any particular community, it constitutes prior art. While companies may still use such knowledge for research purposes, they are precluded from obtaining patent protection over such knowledge. Conversely, as positive protection seeks to prevent appropriation and may impose licensing fees, it places greater emphasis on the need for protected TK to be demonstrably held by traditional communities. Nonetheless, this requirement should not impose unreasonable conditions on its protectability.

This raises the overarching question of whether AI-restored TK can and should be regarded as registrable TK eligible for *sui generis* protection. As indicated in 4.1, some jurisdictions, like Section 9 of South Africa's PPDMIKA, provide protection only for registered TK, whereas the registration of knowledge as TK is subject to specified requirements. Under the PPDMIKA, for example, TK must be transgenerational, developed within a traditional community, and tied to that community's cultural and social identity. It is therefore important to consider whether AI-restored TK can fulfil these requirements.

In this context, acknowledging that *sui generis* TK protection is grounded in IP systems, parallels can potentially be drawn to modest and controversial debates about the applicability of copyright protection to (AI-)restored cultural works, such as historical artworks. The central question here is whether (AI-) restored artworks can qualify for copyright protection. The main argument supporting such protection is that it provides an incentive for conservators to undertake the restoration of culturally significant objects (Li 2022: 375, Mandel 1981). A comparable rationale could apply to the restoration of TK. Adequate protection could encourage traditional communities to share their knowledge for restorative purposes. In contrast, the lack of such protection might dissuade them, as they may fear the appropriation of both their digitised existing TK as well as of the newly restored heritage by others. Nonetheless, the suitability of copyright as a mechanism for protecting AI-restored TK remains questionable. Firstly, the argument for granting copyright protection to restored artworks is not widely supported in prevailing legal commentary. In particular, it seems that the restoration of artworks, especially when AI-assisted, typically lacks the originality and creative autonomy required for copyright eligibility (for eligibility criteria see e.g. *Painer*, C-145/10, 2011, Bridgeman Art Library v. Corel Corp., 1999).

Secondly, copyright fails to account for the collective and cultural dimensions inherent to TK. In particular, if copyright law would provide for the protection of restoration efforts, a copyright could potentially be granted to the restorer, who may not be a member of the traditional community. This could present an improper solution within the context of TK restoration. Furthermore, debates around copyright in the context of restoration efforts often involve historical works that are already in the public domain – where questions concern whether the act of restoration can create a new, protectable work. In contrast, TK should specifically not be regarded part of the public domain in the first place. A deeper analysis of whether AI-restored works can or should receive copyright protection lies beyond the scope of this article. Nonetheless, in light of this potential jeopardy arising from such copyright considerations, a different solution is required to counterbalance this risk in relation to TK. In this context, recognising AI-restored TK as eligible for *sui generis* protection seems paramount. However, this can only be realised if AI-restored TK satisfies the criteria to be encompassed by the definition of TK.

This, however, is complicated by the circumstance that, even without AI involvement, it may often be challenging to prove that certain knowledge constitutes TK and is owned by a specific community (Hossain & Ballardini 2021: 64, Sand 2003: 198). Looking back at South Africa's interpretation of TK as knowledge that has been developed within an Indigenous community, is deeply connected to its cultural and social identity, and is passed down through generations, it appears that the first two criteria can be met by AI-restored heritage. The restoration of TK

requires that efforts are grounded in knowledge that originates from traditional communities and was likely developed by them. The desire of these communities to restore lost elements of this knowledge further underscores its cultural significance, linking it to their identity.

The key issue in relation to the utilisation of AI is thus the question of whether AI-restored TK satisfies the transgenerational aspect typically associated with TK. The transgenerational aspect concerns the principle that the authenticity of TK is ensured by the fact that it has been passed on from generation to generation. The interpretation of this transgenerational principle, which is inherently tied to the essence of what defines TK as 'traditional' (Clark et al. 2004: 778), is thus of paramount concern. The challenge posed by AI involvement is that AI-restored knowledge may be considered a new creation, not having been passed down through generations. The fact that the knowledge got lost indicates that it was not transmitted across generations. Additionally, the communities that hold this knowledge are often viewed more as guardians than as owners in the Western sense (Clark et al. 2004: 778). However, this guardianship entails an active engagement with this knowledge. This aligns with Section 3(b) of South Africa's PPDMIKA, which emphasises that one of its objectives lies in a broader application and development of TK. Or, as Clark suggests, TK "refers to knowledge systems that […] are constantly evolving in response to a changing environment" (Clark et al. 2004: 778). This perspective implies that TK can evolve into something that has not yet been passed down from generation to generation but could be in the future. Moreover, AI itself can be seen as part of the evolving environment in which traditional communities find themselves in the modern era.

In conclusion, there is currently a lack of legal certainty regarding whether AI-restored knowledge can qualify as TK. Nevertheless, there is a pressing need for appropriate protection to support the preservation and restoration of TK. To this end, a broad understanding of the TK concept is essential, and the transgenerational aspect should not be applied too restrictively. Only through adequate protection can traditional communities be encouraged to actively engage in preservation and restoration efforts. The determining factor for protection should thus ultimately be based on the authenticity of the AI-restored content, in consideration of the cultural context from which it originates.

Discussion: Reflections on Authenticity and the Transgenerational Principle

This article has accounted for various legal aspects that can apply when using digital technologies, like AI, to safeguard or restore TK. Before concluding, we want to reflect briefly on how these legal aspects relate to a wider discourse on heritage,

indigeneity, and authenticity. As Li (2022) points out, authenticity is a complex term without a universal definition. This is true in a legal context, but it is even more the case from a heritage studies perspective where authenticity is a somewhat problematic concept. When applied to culture in an anthropological sense – i.e. culture as a system of expressions, practices, and beliefs – authenticity is burdened by essentialist connotations dating back to the age of nationalism and infused with romantic beliefs that nations and people have inherent identities expressed through folk culture. With regards to Western cultures, such essentialist ideas have been relegated to the past (although recurringly resuscitated by nationalists). However, they sometimes linger in discourses on Indigenous cultures where Indigenous people are expected to display a certain form of cultural authenticity in order to be acknowledged as Indigenous and enjoy the privileges or compensations they are lawfully entitled to. Here, ideas of authenticity on the one hand aim to empower Indigenous communities and safeguard their cultural rights, while they on the other hand tend to deny them the fruits of modernity and expect them to maintain a romanticised lifestyle from a distant past (Sissons 2005).

This article addresses a more specific definition of authenticity, related to the discussion on AI-restored TK. Here, authenticity may simply refer how well the restoration resembles the form and shape of what is perceived as the 'original' work. This is, however, not a simple definition either and it is not unrelated to the larger discourse about cultural authenticity. The 'original' work is in many cases an imagined entity since the form and shape of the initial work often tend to be partly or entirely lost – hence the need to restore it. In such cases, the restorations are merely filling in the missing pieces with new content that replicates certain characteristics of the work that is being reconstructed. The goal for restoration of older works, whether done with AI or not, would thus be to "produce output that is 'authentic' in style and content, but not 'original'" (Li 2022). It is necessary to ensure that the restoration does not become a new work in itself in order to respect the authenticity of the work that is being restored: from a copyright perspective, originality needs to remain with the original work otherwise the reconstruction risks becoming a derivative work.

This, however, raises the question of where originality begins. Zondi for instance discusses whether the traditional costumes of the Indigenous Sotho community in South Africa can still be considered authentic to Sotho culture even though the glass beads that now adorn the costumes were introduced by European colonisers in the 15th century, replacing the shells that were initially used (Zondi 2019). Such a definition of authenticity tends to presume that authenticity resides in a precolonial place and time and that everything introduced after that, as a result of colonialism, corrupts that authenticity. This might make sense if the goal is to amend the damages that colonialism inflicted upon Indigenous people by erasing

the traces it left in traditional cultures. However, that is not only an impossible task, it also leads down the rabbit hole of primordialism.

The discourse on restoration of heritage tends to focus on the restoration of cultural objects: paintings, costumes, and other artifacts. This is complex enough in itself, as the example of the Sotho beads show. Discussing authenticity in relation to intangible cultural heritage and TK is even more challenging. As many have pointed out (Clark et al. 2004), TK continuously evolves, and it should not be subjected to a concept of authenticity that freezes Indigenous cultures in a distant state of origin. Embracing the fact that TK changes over time implies that the best way to preserve it might not be to restore it to an original state but rather allow it to transform in harmony with the social and cultural development of the group that holds it.

This however actualises the transgenerational principle discussed above: the connection between the past and the present where the authenticity of TK relies on an unbroken rendering of knowledge from generation to generation. When that chain is broken and knowledge is partially lost, AI can certainly be a useful tool to restore it. This, however, raises the question of whether the authenticity of that knowledge is corrupted when it is reinvented rather than repeated over generations. There is of course no universal answer to that query. The crucial question might be who performs the reconstruction. As discussed in chapter 4.2, copyright could indeed be granted to a restoration conducted by someone outside of the community. If that is done without the consent of the traditional owners of that knowledge, that would obviously violate the rights and the integrity of that community. It could potentially also be in breach of the CBD and the Nagoya Protocol if the knowledge concerns genetic resources. This would however also apply if the reconstruction is made without the use of AI. This touches upon the same dilemma that appears in the discussion about TK databases, where databases maintained by public authorities or other actors outside of the Indigenous community are more likely to suffer a lack of legitimacy.

If an Indigenous community on the other hand utilises AI to reconstruct TK that has been lost but was once held by that community, the question becomes more complicated. The reconstructed knowledge might still be discarded as inauthentic with reference to the transgenerational principle if it turns out that the knowledge has not been handed down by the ancestors and there is no way of knowing if it even reflects their understanding of it. This, however, leads back to primordialism. A more relevant question would be if and how the TK relates to the culture of the living community. If it aligns with the values and perspectives of the community, it implies that the knowledge is indeed embedded in an unbroken cultural tradition, i.e. the link between the past and the present still exists.

It thus seems counterproductive to categorically discard the use of AI to

restore TK on the grounds of authenticity. AI-restored TK could well enjoy the same protection as other TK, for instance through databases and depositories, as long as they are endorsed by the community to which they are attributed. In that sense, authenticity would be based on the restoration's capacity to represent the living community rather than on its seemingly truthful replication of an unknown origin.

Conclusion

TK is central to the cultural identity of Indigenous communities, reflecting their spiritual, environmental, and practical wisdom handed down through generations. However, the spiritual and cultural value of TK is threatened by ongoing abuse and misappropriation, which undermine the sovereignty and dignity of the communities that hold this heritage. TK further faces ongoing erosion, with much of this knowledge being lost due to modernisation, colonisation, or neglect. As highlighted in this article, AI can offer a solution to this problem by offering tools for the reconstruction of fragmented or lost TK, thereby aiding in preserving cultural heritage for future generations. For this to be effective, however, TK further requires adequate legal protection from misuse and misappropriation.

Despite decades of international dialogue, efforts to protect TK within the framework of international law remain largely fragmented and inconsistent. In particular, the reliance on Western IP considerations fails to address the spiritual, generational, and collective dimensions of TK. While national *sui generis* frameworks may offer at least some protection for TK, their limited jurisdictional scope underlines the necessity for a cohesive global strategy.

Furthermore, the registration of TK in databases, which is often required under domestic TK protection laws, is a double-edged sword. While defensive protection mechanisms can prevent misappropriation of registered TK, the registration requirement raises questions about what qualifies as registrable TK. There may exist a perceived conflict between the multigenerational aspect of TK and facilitating the adaptive development of cultural knowledge. To provide effective protection, however, the aspect of generational continuity as a registration requirement should not be interpreted too narrowly, as the purpose of TK protection is not only preservation but also its continued development by traditional communities. In this context, the registrability of AI-restored TK should rather be determined by its authenticity which should reflect the living cultural values of traditional communities rather than static historical fidelity.

To this end, active participation of traditional communities in AI-driven TK restoration projects is essential to ensure that technological interventions align with their cultural values and priorities. When appropriately fostering collaboration,

transparency, and equitable protection, digitisation and AI restoration can create mutually beneficial outcomes: traditional communities gain access to new approaches for preserving their heritage, while the broader global community can benefit from access to knowledge that contributes to the collective cultural and intellectual wealth of humanity. To incentivise traditional communities to share and digitise their valuable TK, robust protection is required to prevent artificial barriers from impeding the rightful recognition and custodianship of AI-restored knowledge.

Declaration of AI Use

AI, in the form of Microsoft 365 Copilot, was used for language editing in the preparation of this manuscript. The amended content was re-viewed and further edited by the authors to ensure the accuracy and quality of the final output.

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