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PROPERTY AND INTELLECTUAL PROPERTY RIGHTS IN ADDITIVE MANUFACTURING (3D PRINTING): A SUI GENERIS PERSPECTIVE WITHIN CIVIL LAW

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Abstract. The article examines the complex civil-law regulation of digital and physical objects created through additive manufacturing technologies. Drawing on comparative analysis of the Uzbek Civil Code, the Laws on Copyright, Patents, and E-Commerce, and strategic documents such as the Strategy "Uzbekistan – 2030" and Digital Uzbekistan–2030, the study identifies significant legal gaps in defining ownership, authorship, and liability concerning 3D-printed objects and their digital design files (CAD models). The article contrasts Uzbekistan's framework with the approaches of the EU, USA, China, Germany, France, and post-Soviet jurisdictions, emphasizing how most countries rely on adapting existing property and intellectual property doctrines rather than introducing a new regulatory regime. The analysis highlights unresolved doctrinal issues such as the dual nature of 3D-printed property (digital and material), uncertainty of rights transfer in digital environments, and insufficient enforcement mechanisms for online infringements. Finally, the author proposes sui generis reforms within Uzbekistan's civil law – clarifying digital goods ownership, expanding copyright scope to CAD files, introducing limited-use exceptions, and strengthening IP enforcement online – aligning national legislation with international best practice and the technological goals of Strategy 2030.

Keywords: additive manufacturing, 3D printing, property rights, intellectual property, digital goods, CAD files, copyright, sui generis regulation

Introduction

Additive manufacturing ("3D printing") represents one of the most profound technological shifts in contemporary production, enabling the direct transformation of digital data into physical objects. This process disrupts traditional civil-law concepts of property, ownership, and creativity by combining two fundamentally different legal domains: intangible intellectual creations and tangible material objects. As a result, conventional legal doctrines are increasingly

challenged in their ability to regulate authorship, ownership, reproduction, transfer, and liability in relation to both the digital design file and the printed object.

Additive manufacturing ("3D printing") raises complex questions for both property law and intellectual property (IP) law. Experts observe that conventional IP categories – *copyright, design, patent, and trademark* – can cover many aspects of 3D printing. For example, "copyright will protect the originality of a work and the creator's right to reproduce it" (Malaty, E., & Rostama, 2017), meaning an original object or its digital design file can be protected as an artistic or literary work.

Industrial design rights cover an object's shape or aesthetic form, while patents protect its technical functions or innovations (and even 3D trademarks can protect product shapes). Likewise, many commentators treat a digital 3D (Ebrahim, 2016) model (design file) as akin to software: it requires "a personalized intellectual effort" and thus qualifies for copyright protection. In some jurisdictions (e.g., France's Intellectual Property Code Art. L613-4), supplying or offering to supply a 3D print file of a patented product is itself prohibited (Malaty, E., & Rostama, 2017). Thus, under existing law "3D files and those using 3D printing for non-commercial purposes" are largely addressable by current IP regimes. That said, commentators note unresolved issues – e.g., who is the "author" or "inventor" if one person designs an object, another digitizes it, and another prints it; and whether printer owners might deserve sui generis rights akin to performers or producers (Malaty, E., & Rostama, 2017) – indicating that unique 3D-printing scenarios may require novel legal thinking.

In Central Asian jurisdictions, including Uzbekistan and Kazakhstan, disputes directly addressing additive manufacturing remain limited; however, existing intellectual property practice provides relevant indications. Copyright law in the region already recognizes computer programs and technical documentation as protected works, which allows CAD files used for 3D printing to fall within the scope of copyright protection where originality is present. In practice, enforcement has focused on unauthorized digital reproduction and distribution rather than the physical printed object.

Industrial design protection in Central Asia has been invoked primarily in relation to consumer goods and industrial components. National IP offices apply functionality-based exclusions similar to those found in European civil-law systems, which suggests that the 3D printing of purely functional spare parts may fall outside design protection. This approach implicitly accommodates additive manufacturing, even in the absence of explicit regulation.

Patent law offers stronger protection in the region, particularly through doctrines addressing indirect infringement. The transfer of technical documentation or digital models enabling the reproduction of patented inventions may be qualified as unlawful use of patented technology, especially where commercial intent is established (European Patent Office [EPO], 2020). By contrast, trademark enforcement related to 3D-printed goods remains underdeveloped, with practical emphasis placed on traditional counterfeit goods rather than digitally manufactured items.

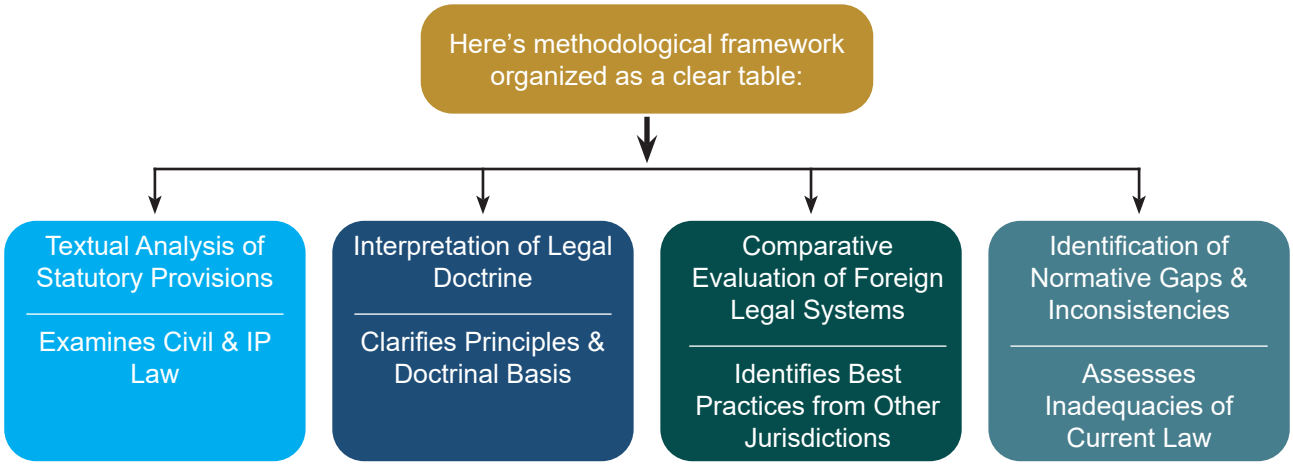
Overall, Central Asian practice reflects an adaptive but fragmented application of traditional civil law IP doctrines to additive manufacturing. This regulatory gap further supports the need for a sui generis civil-law approach that explicitly addresses digital design files, decentralized production, and the blurred boundary between private and commercial use in 3D printing.

Against this background, the study seeks to assess whether existing civil-law doctrines sufficiently address the legal realities of additive manufacturing or whether a specialized, sui generis regulatory approach is required. The central research question guiding this article is: To what extent does Uzbekistan's civil and intellectual property

framework provide adequate protection for property and IP rights arising from additive manufacturing, and what normative reforms are necessary to ensure legal certainty and balance? The main purpose of this article is to critically examine the intersection of property law and intellectual property law in the context of additive manufacturing, highlighting the challenges posed by digital design files, decentralized production, and the hybrid nature of 3D-printed objects. It aims to evaluate the adequacy of Uzbekistan's existing civil-law and IP framework and to propose normative reforms or a sui generis approach that ensures both legal certainty and balanced protection for rights holders and users.

Methods

This research adopts a doctrinal and comparative legal methodology designed to provide a structured and systematic analysis of additive manufacturing within civil law. The study is based on a critical examination of normative legal sources, including the Civil Code of the Republic of Uzbekistan, the Laws on Copyright and Related Rights, Patents, Industrial Designs, the E-Commerce Law (2022), and strategic policy documents such as "Digital Uzbekistan–2030" and the State Program on Intellectual Property Development (2022–2026).



Comparative analysis includes civil-law systems (Russia, Germany, France, and EU Member States) and common-law jurisdictions (United States, China) to identify dominant regulatory patterns and deviations in the treatment of 3D printing. The study also uses international materials, including WIPO policy discussions, to assess global trends concerning the possible emergence of sui generis regimes.

This methodological approach allows evaluation of Uzbekistan's framework both in isolation and within the broader context of global legal development, ensuring analytical coherence and policy relevance.

Discussion

The analysis demonstrates that while most jurisdictions rely on adapting existing intellectual property doctrines, they nevertheless acknowledge unresolved legal challenges associated with the hybrid nature of 3D printing.

Internationally, civil-law jurisdictions have approached 3D printing within their IP and property codes (Kantaros, 2024). In Russia (a civil-law system), legal analysts note that a 3D model obtained by scanning a copyrighted sculpture "will be protected by copyright as a digital copy". Conversely, if a model is created by creative effort from scratch, it is an independent copyrightable work. Russian commentators even suggest that 3D models could be registered as industrial designs or three-dimensional trademarks, securing separate protection for the same design under different regimes. The same principle holds elsewhere

in Europe: for example, EU law allows unregistered or registered design rights in shapes, copyright protection for creative CAD files, and patents for functional inventions. The European Commission has prioritized 3D printing for innovation, but no EU-wide "3D-specific" law exists – rather, existing IP laws apply (Deloitte Legal, 2017). In fact, a WIPO study notes that current IP law in most countries suffices to cover 3D printing in practice. It even raises the question of a hypothetical *sui generis* right: "would it make sense to consider creating a sui generis right for 3D printing" similar to database protection?. So far, no country has created a dedicated "3D Printing IP" right; instead, legal systems adapt their established civil-law doctrines to these novel digital-physical products (World Intellectual Property Organization [WIPO], 2020).

In common-law jurisdictions like the USA, similar principles apply by analogy. A 3D design file can be copyrighted as a "literary work" or computer program, and printing a patented item without permission is patent infringement under 35 U.S.C. §271. U.S. courts have recognized that copyright in a digital file extends to any unauthorized reproductions of the described object. Hobbyist printing for private use falls under the U.S. fair-use doctrine (similar to other private-use exceptions), but substantial copying of protected objects is actionable. China likewise applies its patent, copyright and design laws to 3D printing; Chinese scholars urge combining enforcement of copyright (for design files) and patent/trademark laws for printed products. Globally, the trend is to rely on existing IP rights rather than inventing entirely new categories, even as policymakers debate whether any unique "sui generis" regimes are needed.

Uzbek law currently addresses 3D-printed goods through its general civil and IP laws, without a bespoke 3D-printing statute. The Civil Code defines the objects of civil rights to include "inventions, industrial designs, and works of science, literature, art and other results of intellectual activity." This codifies intellectual creations as property in themselves (as civil-law "objects"). Thus, an original 3D model file or a printed object embodying a patentable invention fits within Uzbekistan's notions of property: patents, designs, and copyrights are considered intangible "property rights" that can be owned, transferred, or licensed.

Under Uzbek patent law, inventions receive up to 20 years of protection, industrial designs 10 years, and utility models 5 years (Law on Invention, 2022). In practice, a 3D-printed product replicating a patented machine or component would infringe the patentee's exclusive rights unless a license is obtained. Likewise, if a printed object's shape is covered by a registered design patent, production may be forbidden. The law even allows patent terms to be extended in exceptional cases. Uzbekistan's copyright law extends to all creative works ("science, literature and art resulting from creative activity") and explicitly includes three-dimensional creations such as "sculptures [and] models." This implies an original 3D design created by an artist or engineer could be protected as a creative work. Copyright automatically vests in the author, while patents/designs require registration.

For digital design files, Uzbekistan presently relies on its new E-Commerce Law (2022), which defines *"digital products"* as "electronic copies of objects of intellectual property" (Law on Electronic Commerce, 2022). In other words, a 3D CAD file sold or downloaded online is treated as a digital copy of some copyrighted or patented work. E-Commerce Law Articles 20–21 set formal requirements for digital sales contracts (e.g. confirmation by receipts or system messages), but they focus on transaction formalities, not substantive IP rights. In practice, a 3D file is typically licensed (not "sold") under user agreements, leaving unresolved questions: is the user a licensee or owner of the digital product? Can they freely print it? Current Uzbek law does not

clearly define ownership of downloaded digital goods. Meanwhile, once a user prints an object, that tangible object becomes the user's personal property under general ownership rules, but this does not override any outstanding IP claims on the design.

Beyond existing codes, Uzbekistan's policy documents signal attention to digital innovation and IP modernization. The "Digital Uzbekistan–2030" strategy (2020 Presidential Decree UP-6079) emphasizes *"active development of the digital economy"* and the commercialization of advanced IT projects. It specifically calls for practical use of technologies like artificial intelligence and support for tech-transfer of innovative developments. Likewise, the State program on Intellectual Property (2022–2026) (Resolution PR-221) explicitly aims at "elimination of existing gaps and contradictions in IP legislation" and continuous improvement based on world practice. These high-level directives imply that Uzbekistan recognizes the need to update its laws for emerging technologies. Indeed, recent presidential decrees in niche industries show 3D printing entering state policy: for example, a 2023 decree (PP-331) ordered study of *"3D-printing technologies in the production of shoe parts"* to enhance the leather and footwear sector (Resolution No. PP-331, 2023).

However, gaps remain. No Uzbek law specifically addresses 3D printing or digital models. The Civil Code treats all IP outputs as property, but it does not distinguish digital designs from other intangible assets. Copyright law covers creative works broadly, yet does not explicitly address 3D files or private 3D printing exceptions. Patent law protects printed inventions, but there is no clarity on whether producing a one-off 3D-printed item at home falls under a private-use exemption (unlike some countries' patent laws).

Moreover, the e-commerce framework treats 3D design files as digital products, but offers no substantive IP rule: it defines *what* they are but not *how* their rights are used or transferred. Practically, unauthorized distribution of a protected 3D design file would be actionable as copyright or patent infringement under Uzbek law, but the law lacks any 3D-specific penalties or compliance measures.

Results

The results reveal that Uzbekistan's reliance on conventional civil law mechanisms provides only partial legal certainty for additive manufacturing. The dual digital-physical nature of 3D printing challenges classical doctrines, as ownership of the tangible object does not equate to unrestricted rights over the underlying intellectual content.

These reforms do not necessarily entail creating an entirely new IP category but represent sui generis adaptation of existing norms, aligning with Uzbekistan's strategic objectives under Digital Uzbekistan–2030 and its intellectual property reform agenda.

Key challenges include: (1) Lack of explicit protection for digital 3D models. Although copyright can cover a creative CAD design, users and courts may not clearly classify a complex model (e.g. a parametric engineering file) as copyrightable or not. (2) Ambiguity of ownership/licensing for digital goods. Uzbek law should clarify whether a downloaded 3D model is sold as an asset or licensed, and what rights the recipient has. (3) Absence of a private-use exception. Without guidance, a citizen printing a patented component at home technically infringes the patent, even if intended for private use. (4) Enforcement difficulty. Policing IP on the internet (e.g. infringement on 3D file sharing sites) requires effective intermediary liability rules, which Uzbekistan is only beginning to develop (IP Strategy calls for modern enforcement by digital means). (5) No sui generis regime. There is no special IP category for 3D printing (contrast "database" rights in EU). This may be acceptable short-term, but as global best practice evolves, Uzbekistan may need unique provisions.

Additionally, to improve the system, Uzbekistan could consider the following measures:

Reform Area / Measure	Proposed Action	Rationale / Example
Clarify Digital Goods in Civil Law	Amend the Civil Code (e.g., Article 81) to explicitly include "digital designs" or "computer models" as transferable property, or define the transfer of digital files.	Aligns with the E-Commerce Law's definition of "digital products" and ensures 3D models are consistently treated in transactions.
Expand Copyright Scope	Amend Copyright Law to affirm that computer models and digital mock-ups fall under "works of art" or "computer programs."	Prevents uncertainty about copyrightability of 3D designs and supports the IP Strategy's goal of aligning with international best practices.
Introduce Limited Use Exceptions	Create a narrowly tailored personal-use exception for non-commercial 3D printing.	Balances innovation with enforcement: allows families to print spare parts at home while prohibiting commercial copying. Exception must be clearly defined to protect IP incentives.
Address Infringing File Distribution	Strengthen rules for online intermediaries; treat infringing 3D print files as means of implementing a patent.	Emulates France's Article L613-4 IP Code; enables rights holders to sue uploaders of illegal files, supporting IP Strategy's Internet enforcement goals.
Support Technical Measures	Encourage use of digital rights management (DRM) for 3D files, including unique identifiers, watermarks, or blockchain tracking.	Helps rights holders monitor and identify unauthorized prints, as recommended by WIPO.
Raise Awareness and Training	Conduct specialized legal education and industry outreach (workshops for judges, customs officials, businesses).	Ensures correct application of IP law; for instance, recognizing copyright in a single 3D-printed chair design.
Monitor and Adapt via Strategy 2030	Use national strategies ("Uzbekistan – 2030" and "Digital Uzbekistan– 2030") to update laws and fund IT research.	Allows policymakers to track global trends (e.g., EU database-right analogues for 3D printing) and refine Uzbek law accordingly.

By filling identified legal gaps, Uzbekistan can better protect innovators while promoting advanced manufacturing. The IP Strategy's call to eliminate legislative gaps aligns with creating a clearer regime for 3D printing. Given Uzbekistan's rapid push for digital economy development, it is timely to integrate additive manufacturing into its civil/IP laws. Uzbekistan may ultimately not need a wholly new "sui generis 3D right", but it will need sui generis thinking – tailored adjustments within its civil law framework – so that digital models and 3D-printed goods are governed with the same clarity and balance as other property and IP assets.

Conclusion

Additive manufacturing presents a new hybrid paradigm where digital creativity directly generates tangible property, destabilizing traditional civil-law classifications. Uzbekistan's current legal framework formally recognizes intellectual creations as civil law objects, yet fails to adequately address the specific risks and complexities posed by 3D printing technologies.

The study concludes that Uzbekistan does not require the creation of a new standalone "3D printing right," but rather demands targeted sui generis normative adaptation within existing civil and intellectual property systems. Clarifying digital ownership, strengthening enforcement mechanisms, and refining licensing rules are essential to ensure balanced legal protection and innovation promotion.

By modernizing its civil law framework in line with global practice and national development strategies, Uzbekistan can secure legal predictability while fostering technological progress, positioning itself as a responsive and forward-looking jurisdiction in regulating additive manufacturing.

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