The Legal Protection of Technical Innovation: From Legislative Construction to Procedural Transformation: A Study on the Application Challenges for Startups



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Abstract:

Innovation represents the fundamental pillar and backbone of competitiveness and scalability for startups. Legally, it is defined as the creation of new technical, commercial, or organization solutions that provide a competitive advantage to the innovator. In startups, innovation is not merely an entrepreneurial asset but the primary factor for differentiation from competitors in multi-technology markets. However, in the absence of adequate legal protection, these entities face serious risks, including the infringement of industrial property rights in various forms such as counterfeiting, duplication of designs and models, theft of graphic varieties and creations, and the exposure of trade secrets. This also leads to the loss of intellectual property rights, a decline in market advantage, and a reduced opportunities to attract investment. This paper examines the national and international legal frameworks governing the protection of innovations in startups, focusing on patents, trademarks, copyrights, trade secrets, and contractual guarantees. This is achieved by reviewing the available forms of protection, such as civil and criminal legal protection, and studying the effectiveness of methods for protecting innovative outputs. The study also dedicates a section to the challenges and obstacles facing startups, including financial constraints, procedural complexities, barriers to cross-border protection, and weak law enforcement in some jurisdictions. The paper concludes with practical recommendations to enhance intellectual property protection strategies in innovation-driven emerging economies.

Key words: *Startups; industrial property; legal protection; counterfeiting; unfair competition; industrial property protection disputes.*

Introduction:

Startups operate in highly competitive environments where innovation is their authentic and primary weapon and their true capital. However, these innovations, whether technological, digital, or innovative business models, are vulnerable to imitation, copying, and illicit appropriation. Many startups lack awareness of the legal protections available domestically or when expanding their activities abroad. They may also face financial and procedural challenges in securing their existence and the continuity of their operations. Consequently, the weak protection of industrial property elements and assets undermines their ability to enter the market and thus to compete, affecting their attractiveness for investment and their long-term sustainability. From this, the central problematic of the topic emerges:

How to achieve a balance between promoting innovation and protecting industrial property rights?

This requires the activation of effective legal frameworks at both national and international levels. Challenges related to financial constraints, procedural complexities, and barriers to cross-border protection also stand out, necessitating the adoption of effective governance mechanisms to enhance the protection of industrial property in innovation-driven emerging economies.

To address this problem, we have undertaken a comprehensive study of the available legal frameworks, including the registration and protection of patents, trademarks, copyrights, trade secrets, and contractual guarantees, in addition to reviewing the available mechanisms for protecting innovative outputs. The challenges facing startups in this context must also be addressed, which calls for providing practical recommendations to enhance industrial property protection strategies. This scientific paper aims to present a comprehensive understanding of the legal mechanisms that protect innovation in startups, analyzing the applicability of protection principles to patents, trademarks, copyrights, and trade secrets, as well as identifying the challenges startups face in securing legal protection.

Recent researchers emphasize the strategic value of intellectual property protection for startups. Studies show that emerging entities with strong industrial property portfolios attract more venture capital financing (Hall & Harhoff, 2020), while other research has highlighted the role of trade secrets in fast-moving digital sectors (Poh et al., 2021). Comparative analyses have indicated disparities between developed and developing countries in the effectiveness of legal protection mechanisms (WIPO, 2023). From the foregoing, the importance of the topic emerges in strengthening the innovation ecosystem by raising awareness of intellectual property rights and helping startups avoid infringement disputes and protect their competitive advantage.

This is achieved by supporting policymakers in reforming intellectual property frameworks to better serve entrepreneurs and to enhance investor confidence, especially in the early financing stages of innovative projects. In our study, we have

primarily adopted a descriptive and analytical methodology, supported by a comparative approach where necessary. We also used a deductive method in constructing the results and recommendations.

To fully address the topic, we have divided the paper into three axes. The first axis deals with the conceptual framework of innovation and startups. The second axis covers the national and international legal frameworks for the protection of innovation as a startup asset. In the third axis, we study the legal protection mechanisms for innovation, such as protection under civil and criminal law, and administrative and procedural protection.

Part I:

Conceptual Framework of Innovation and Startups

1.1 - Definition of a Startup: Legislators generally do not provide precise, uniform definitions of a startup in laws, whether at the local, regional, or global level. However, in national legislation (Algerian), it is defined as a newly established commercial company, initially self-funded, that meets specific conditions such as innovation based on leveraging technology to transform its ideas into solutions, products, or services that can be tangibly realized and for which there is a pressing consumer need. As a preparatory stage, it seeks to obtain a "startup" label under the applicable regulations, particularly the provisions of Article 11 of Executive Decree 20-254 of September 15, 2020, which establishes the National Committee for granting the startup, innovative project, and business incubator labels. A startup is not merely a small project but a temporary human organization for scientific and technological production, designed to research and formulate a new, innovative, and contemporary business model that is investable, scalable, and capable of rapid growth under conditions of absolute uncertainty (Ries, 2011). This definition is of paramount importance as it represents the cornerstone for activating specific legislative incentives, such as obtaining the "startup label," in addition to tax, customs, and even financial and real estate incentives.

1.2- Innovation as an Intangible Asset (Moral Capital): In the context of the legal engineering of startups, innovation is not viewed merely as a creative output, but as a core intangible asset. Its value often exceeds the value of the company's tangible assets. Indeed, an innovative or creative human idea builds civilization and cannot be valued in money (Shalaby, 2018). From a jurisprudential perspective, it is the classification of innovation that determines the applicable legal regime for its protection and valuation.

1.2.1- Classification of Innovation within the Integrated Legislative Structure of a Startup: Regulations must establish a clear framework for classifying innovation according to its nature, degree of novelty, and seriousness, through the constituent elements of its structure:

a) **Radical Innovation (also called Disruptive Innovation):** This is innovation that involves a significant technological breakthrough creating a new market. This type legally and regulatorily falls within the scope of patents. The legal engineering obstacle in this type is the necessity of satisfying the "inventive step" condition, also known as "non-obviousness," and ensuring that the invention is not merely a logical extension of the "prior state of the art".

b) **Incremental Innovation:** This refers to improvements and developments made to existing products or processes. Although they may not always meet the stringent conditions for a patent, they are often protected as "utility models," sometimes called "petty patents." This provides a shorter protection term but with faster and less expensive registration procedures, which is well-suited to the speed required by startups.

c) **Process Innovation:** Often appearing in fields like Fintech or logistics, this relates to "business models." Since many legislations exclude business methods from patentability, legal engineering relies heavily on "trade secrets and contractual guarantees," as well as "Non-Disclosure Agreements" (NDAs), to prevent competitors from reverse-engineering the operational logic (Ko, 2017).

1.2.2- The Shift from Tangible to Intangible Capital: Traditional commercial law was built on protecting tangible "physical property." However, "intellectual property" has now become the dominant reference for a startup's public finances, requiring a fundamental shift in the perception of "property." This is reflected in the acceptance of a contribution of work (Apport en Industrie) in the sharing of profits and net assets and losses, following the amendment of the Algerian Commercial Code, **Ordinance 75/59** of September 26, 1975, by **Law 15/20** of December 30, 2015, particularly Article 567 bis, and Article 715 bis 140 of **Law 22/09** of May 5, 2022, amending and supplementing the Commercial Code, in addition to the provisions of Article 416 of the Algerian Civil Code, **Ordinance 75/58** of September 26, 1975, as amended and supplemented.

a) **Economic Value:** Innovation is the primary driver of the "premium price, services, and unique solutions" that a startup can introduce and command in the market for a reasonable period, during which others cannot compete.

b) **Investment Attractiveness:** In the venture capital ecosystem, the strength of an intellectual property portfolio reflects the company's future "freedom to operate," based on monitoring the position of competing companies offering the same solutions and their market share. Without documented intangible assets, a startup lacks the necessary "guarantees" for early-stage and preparatory financing.

1.2.3- The "Legal Fragility" Gap: A kind of contradiction emerges between innovation as a core driving force for a startup and its intangible nature, which makes it distinctively vulnerable. Unlike a tangible, embodied product, a digital algorithm or a product's chemical formula can be instantly appropriated through digital hacking or

employee poaching, i.e., exposure to "vulnerability to imitation." Therefore, the "legislative structure" must treat innovation not as a static idea, but as a dynamic asset that requires protection throughout its entire lifecycle, from the "Proof of Concept" (PoC) stage to market expansion. This necessitates a proactive application of Intellectual Property Rights (IPR) to transform a "fragile idea" or a technically feasible and viable embryonic "fragile product model" before full development into a "defensible property right" (Vaverka, Intellectual Property Protection for Startups, A Law and Economics Perspective, 2023).

1.3 - The Strategic Role of Legal Engineering in a Startup's Lifecycle: Legal engineering acts as a structural blueprint that transforms raw innovation into a legally defensible, investable, and bankable institutional asset. Unlike traditional legal advice, which is reactive and conflict-driven, legal engineering is a proactive, multidisciplinary approach that integrates law, technology, and strategic management into a single, multi-level domain to minimize risk and maximize value.

1.3.1- Defining the "Proactive" Engineering Approach: Legal engineering involves the deliberate "construction" of the startup's legal identity, including in its early stages:

a) **Structural Optimization:** Selecting the optimal legal form for the company, such as a joint-stock company (SPA), a limited liability company (SARL), or a simplified joint-stock company (SAS), to allow for future financing, protection of intellectual property, and access to investment incentives.

b) **Risk Mitigation by Design:** This is achieved by implementing internal governance protocols that ensure every line of code or technical diagram produced is automatically and legally transferred to the company's ownership (Abdul, 2025).

1.3.2- The Chain of Title: The most critical task in the legal engineering of startups is ensuring an "unbroken chain of title." Startups often begin as informal collaborations among founders, freelancers, or university researchers. Without precise legal engineering, the "ownership" of the innovation remains with the individual innovator rather than being transferred to the corporate entity.

a) **Assignment of Rights:** This is achieved through the drafting of "Intellectual Property Assignment Agreements" that transfer rights from the "human" innovator to the startup.

b) **"Work for Hire" Doctrine:** Guiding national legislation to ensure that contributions from non-founding employees or external consultants are legally considered the property of the startup from the moment of innovation (Abdul, 2025, pp. 3-4).

1.3.3 - Freedom to Operate (FTO) Analysis: FTO analysis is a core component of legal engineering. It is a fundamental assessment to ensure that the startup's

innovation does not infringe on patents owned by third parties (Iain M. Cockburn, 2009).

a) **Defensive Engineering:** If a "patent thicket" is identified, legal engineers work with R&D teams to "design around" the scope of existing protections, ensuring market entry without facing debilitating lawsuits.

b) **Clearance Opinions:** Providing investors with formal legal opinions confirming that the startup has the necessary "legal space" to commercialize its technology.

1.3.4 - Legal Engineering as a Driver of Valuation in Funding Rounds: It is well-established from observing the tendencies of financiers that they do not invest venture capital in a mere "brilliant idea," but rather in the legal certainty surrounding that idea (Kanem Karima, 2025).

a) **Due Diligence:** Effective legal engineering ensures that when an investor conducts "due diligence," they will find a clean structure of contributing innovators, as well as secured intellectual property files and a clear regulatory roadmap.

b) **Registration and Pledging of Intellectual Property:** This involves "engineering" intellectual property to transform it into a tangible property right, such as a registered patent. The company can then use these assets as collateral for financing through mechanisms like the National Investment Fund (FNI), which is the Algerian state's arm for implementing high-value structured public investment.

Part II: National and International Legal Frameworks for the Protection of Innovation as a Startup Asset.

Legal protection in a startup's strategic architecture is rarely a single event; rather, it is a multi-layered system that creates overlapping barriers to prevent competitor entry. This axis examines the integration of local legislative structures such as Algerian Investment **Law 22-18** and the global intellectual property system.

2.1- The Multi-Layered Protection System: A "defense-in-depth" strategy. Legal engineering requires a comprehensive protection strategy; relying on only one form of intellectual property represents a systemic risk. A robust system is based on a combination of the following four pillars (Correa, & Viñuales, 2016).

2.1.1- The Patent Pillar: Patents represent the "gold standard" of protection for R&D-based enterprises, as an optimal means of securing technological monopolies and transforming innovation into a "patentable asset." This requires proving its novelty, inventive step, and industrial applicability. A patent is a negotiating tool that allows enterprises to cross-license or secure "venture debt" using the patent as intangible collateral. In the national context, startups with the label benefit, according to the regulations of the National Institute of Industrial Property (INAPI), from the relevant ministerial sector fully covering the costs of protecting patents and intellectual property (Decree, 2005, pp. 27-35), along with reduced fees for filing, certificates of addition,

priority claims, patent publication, annual fees, and obtaining information, while also expediting the processing of applications for trademarks and industrial designs and models.

2.1.2- The Trademark Pillar: While patents protect the "mechanism," trademarks protect the "innovator's identity," thereby securing "market identity" and "goodwill." For digital enterprises, the trademark can become more valuable than the source code itself. Protection extends to "trade dress" and the unique features of the product, preventing "market confusion" and protecting the enterprise's "legitimate expectations" of market exclusivity (Order, 2005, pp. 22-27).

2.1.3- The Trade Secret Pillar: Not all elements and structures of innovation need to be disclosed in a patent application. Many enterprises, especially in the field of AI algorithms, resort to a "black box" strategy by protecting trade secrets, which can be complementary to patents. This method has the advantage of having no expiration date and no registration costs. However, it requires "reasonable measures" to maintain secrecy, such as "encryption" and strict "Non-Disclosure Agreements" (NDAs). Without these internal engineering procedures, legal protection becomes ineffective (David S, 2019).

2.1.4- The Copyright Pillar: Under the Berne Convention, software source code is protected as a "literary work" from the moment of its creation, just like software applications and digital content, as a creative work protected automatically without registration. The challenge, however, is that copyright protects the "expression" of the code, not the "functional idea" Therefore, it must be combined with "End-User License Agreements" (EULAs) to prevent reverse engineering and to ensure control over usage in applications and software.

2.1.5- Integration with the Investment Environment: The legislative structure in Algeria has evolved under Law 22-18 of July 24, 2022, concerning investment. Article 4 thereof provides for the acquisition of intangible assets that fall directly within the activities of goods and services production chains, while Article 9 confirms the state's guarantee of intellectual property rights protection. This makes intellectual property elements vital components of an "investment project." The Algerian Investment Law also provides a guarantee against "unforeseen legislative changes," as stated in Article 13 of the Investment Law.

The Algerian legislator has further enhanced the investment-friendly environment through the Finance Law for 2023 and its amendments in 2025 and 2026 by expanding the scope of tax and financial incentives for startups holding the "Label." The most notable of these is the exemption from corporate income tax (IBS) and personal income tax (IRG) for 4 years, with a possible extension to 6 years in the 2026 Finance Law upon label renewal, in addition to a deduction of R&D expenses up to 30%, and customs exemptions on equipment. The "startup label" also acts as a procedural catalyst for accessing the National Investment Fund (FNI), thereby

protecting the enterprise's investments in its IP portfolio under the principle of legal security.

2.2- International Frameworks and Transnational Protection: Considering that innovation rarely remains within national borders and given the requirements of modern technological projects which are "born global," legal engineering strategy must anticipate expansion into regional and international domains.

2.2.1- The Principle of Territoriality: Intellectual property rights are fundamentally territorial in nature. A "patent" granted by the National Institute of Industrial Property (INAPI) does not provide automatic protection beyond national borders. Legal engineering bridges this gap through the Paris Convention, signed in 1883, which is the cornerstone of international intellectual property law. It is one of the first and most influential intellectual property treaties, having established the fundamental rules that ensure the protection of innovations and trademarks across national borders. One of its most important principles is the "right of priority," which allows an enterprise that has filed its first application locally to claim a "priority date," giving it a period of 12 months (for patents) or 6 months (for trademarks) to file in other countries while retaining the original date, thereby preventing "predatory filings" by competitors (Organization, 2026).

2.2.2- The Patent Cooperation Treaty (PCT): The PCT, administered by the World Intellectual Property Organization (WIPO), is the most significant procedural development of the Paris Convention. While the Paris Convention laid down substantive principles like the right of priority, the PCT came to facilitate the practical procedures for obtaining patent protection in multiple countries. It is thus the procedural catalyst and an indispensable tool for enterprises with limited liquidity and budgets. Instead of filing separate and costly applications in each country, the treaty allows for a "unified international application." It also grants a 30-month period to enter the "national phase," a vital period for startups to secure investment or validate the market before committing to the high costs of national filings (WIPO, 2026).

2.2.3- The Madrid System for the International Registration of Marks: This system is the most important global legal instrument for protecting trademarks across borders, administered by WIPO. It is based on two treaties: the Madrid Agreement of 1891 and the Madrid Protocol of 1989. The Madrid System provides a centrally administered means to protect a trademark globally with a single application, in one language, and for a single set of fees, enabling trademark owners to protect their marks in a large number of countries (over 130 member states), which facilitates portfolio management and maintains the "chain of title" across borders (System, 2026).

2.2.4- Disparities in Legislative Structures and International Agreements: The "Agreement on Trade-Related Aspects of Intellectual Property Rights" (TRIPS) is considered a comprehensive legal framework that imposes "minimum standards" for intellectual property protection on all member states of the World Trade Organization. For startups, understanding these standards is not merely a routine procedure but a

necessity for protecting innovation and attracting investment. However, difficulties remain when it comes to enforcement. For a startup, Bilateral Investment Treaties (BITs) provide an additional layer of protection against the "expropriation" of intangible assets and ensure respect for the innovator's "legitimate expectations"[footnoteRef:16]. Legal engineering relies on using "regional hubs" like the European Patent Office (EPO) to reduce procedural complexities (Alan M Anderson, Bobak Razavi, 2010).

2.3- The Doctrine of Legitimate Expectations in Emerging Economies: The legislative structure in emerging nations, particularly investment laws and their executive decrees, seeks to protect the legitimate expectations of investors through the maturity and stability of the legal environment. This principle is a pillar for the stability of startups, as the decision to invest effort and money is based on the "predictability" of the legal system. This principle is one of the most controversial and academically debated when applying the standards of Fair and Equitable Treatment (FET), especially in the context of emerging economies undergoing transitional phases or deep legislative reforms amidst administrative-political obstacles or business risks resulting from market fluctuations.

2.3.1- Conceptual Roots: Legitimate expectations arise when the administration provides specific, stable, and repeated prior assurances, akin to legislative custom, that induce a private party to act affirmatively. A startup obtaining the "label" is akin to a legal charter granting it tax advantages and customs facilities. Therefore, under this principle, the host state of the investment, whether domestic or foreign, may not arbitrarily withdraw these incentives or change the "rules of the game" without a transitional period or compensation.

2.3.2- Stability of the Legislative Structure: Legal engineering uses the principle of "legal security" and "stabilization clauses" to ensure that the legal system in force at the time of investment remains applicable to the enterprise for a specified period, thus protecting the "asset of innovation" from political or economic fluctuations (Sattorova, 2024).

Part III: Legal Protection Mechanisms: Civil, Criminal, Administrative, and Procedural.

This axis moves from the theoretical structure to practical mechanisms. Rights without procedural mechanisms for their enforcement are valueless.

3.1- Civil Protection and Contractual Guarantees: Civil protection is the most diverse and commonly used tool in disputes. It operates on two levels: tort liability and contractual autonomy.

3.1.1- Counterfeiting Action: The primary mechanism for protecting industrial property. It requires proving the protected right, the illicit act, and the resulting damage. The most important remedy here is the issuance of an "injunction" to stop the infringing product and preserve the enterprise's competitive advantage.

3.1.2- Contractual Guarantees: Protection through "private law." Legal engineering uses the substance of contracts to create immediate and private protection systems, such as “NDAs” that protect "know-how" and employment contracts that ensure innovations accrue to the company.

3.1.3- "Provisional Measures" Strategy: To address the time gap between infringement and a final judgment, civil protection systems allow for a "descriptive and seizure of counterfeit goods" ("saisie-contrefaçon") to document evidence and confiscate goods before trial, in addition to "interim injunctions" to temporarily halt the infringing activity.

3.1.4- Alternative Dispute Resolution (ADR): Legal engineering favors arbitration, mediation, and negotiation clauses due to their speed, confidentiality, and the technical specialization of arbitrators, which protects the enterprise's reputation and its secrets (Thomas Petermann, Erik Bodker, 2022).

3.2 - Criminal Protection: While the purpose of civil protection for a startup's assets is to obtain civil damages to compensate for harm, criminal protection is designed for deterrence and punishment. Criminal protection includes several forms, the most important of which are deterring counterfeiting and theft. Most laws classify the willful infringement of industrial property as a criminal offense, including financial penalties and imprisonment against acts of willful infringement of industrial property rights. This represents a strong deterrent against "industrial espionage" and the systematic copying of digital assets. A criminal complaint also allows for the intervention of the public prosecutor and specialized judicial police to conduct raids, searches, and seizure of servers, which a civil litigant cannot do alone. In the high-risk world of technological innovation, civil litigation is often insufficient to stop sophisticated "industrial espionage" or large-scale counterfeiting operations that could bankrupt a startup before it reaches its primary funding stage.

3.2.1- Criminalization of Intellectual Property Infringement: Most modern legal systems, including the national legislative system, classify the willful infringement of industrial property as a criminal offense:

a) **Actus Reus:** This includes the unauthorized physical manufacturing, offering for sale, or distribution of products that infringe a registered patent, trademark, or industrial design.

b) **Mens Rea:** Criminal prosecution requires proof of "bad faith" or fraudulent intent. For a startup, proving that a competitor knowingly copied technical plans and drawings is a powerful lever in legal engineering, as it elevates the dispute from a mere commercial disagreement to a matter of public order.

c) **Penalties:** Penalties typically include heavy fines, often calculated as multiples of the illicit profit, and imprisonment. For legal entities like corporations, criminal liability can lead to the "dissolution of the enterprise" or a permanent ban from participating in public procurement (Wang, 2022).

3.2.2- Industrial Espionage (Andrew K, Karthik Ta, 2026)**:** The theft of "intangible secrets." Industrial espionage represents a specialized threat to startups, particularly in "Deep Tech," biotechnology, and cybersecurity sectors. It involves the illicit appropriation of confidential information such as algorithms, chemical formulas, or customer databases through digital hacking, bribery, or employee enticement.

a) **Criminal Protection of Trade Secrets:** In many jurisdictions, the theft of trade secrets is prosecuted under specialized "economic espionage" laws or broader "computer fraud and abuse" laws.

b) **The Insider Threat:** Legal engineering takes into account the fact that espionage often occurs from within. Criminal law provides a framework for prosecuting former employees who "leak" proprietary data to a competitor or a foreign entity, classifying these acts as disclosure of a professional secret or "theft of intangible property" (Curti, 2023).

3.2.3 - Role of the Public Prosecutor and Specialized Units: Unlike civil cases managed by the enterprise's legal team, criminal cases involve the public prosecutor or attorney general.

a) **State Intervention:** When a startup files a criminal complaint, it activates the state's special investigative powers. Specialized judicial police units, such as cybercrime or economic crime divisions, can conduct raids, seize servers, and intercept communications—actions a civil litigant cannot undertake.

b) **International Cooperation:** Since industrial espionage and counterfeiting often have a "transnational" dimension, criminal protection benefits from international networks like “INTERPOL” or “EUROPOL” to track the flow of counterfeit goods or identify the source of cyberattacks.

3.2.4 - Practical Challenges in Enforcing Criminal Law: Surveying the overall difficulties facing criminal protection for startups, we find that the most significant are:

a) **Burden of Proof:** The standard of proof in criminal law is "beyond a reasonable doubt," a much higher and more impactful standard than its civil law counterpart, which is based on the "preponderance of the evidence or "balance of probabilities" Technically proving that a competitor "stole" an idea rather than independently inventing it is extremely complex.

b) **Risk of Disclosing Trade Secrets:** Since criminal proceedings are public, the enterprise must be cautious not to reveal more of its trade secrets during the "discovery" phase of a criminal trial (Malika, 2021).

c) **Limited Resources:** Public prosecutors often prioritize cases related to public health, such as "counterfeit drugs," over the commercial interests of a single startup, which may be given lower priority. Therefore, legal engineering recommends a "parallel strategy": filing a criminal complaint to secure evidence and deter the

infringer, while simultaneously pursuing a civil action to obtain an interim injunction to stop the infringement.

3.2.5 - Deterrence through Cyber-Legal Engineering: In the face of these challenges, startups are increasingly adopting a "cyber-legal" approach, which involves integrating technical barriers (encryption, digital watermarks, and blockchain timestamping) with legal notices. By making it clear that the system is protected by both "technical walls" and "criminal statutes," the enterprise raises the level of risk for potential "industrial spies," thereby achieving deterrence through a combination of law and technology (Jaber, 2021, pp. 377-474).

3.3 - Administrative and Procedural Mechanisms: Administrative procedures represent the "regulatory bridge" between the legislator's protective intentions and operational reality. In the framework of legal engineering, administrative mechanisms represent the "regulatory bridge" connecting the state's legislative policy intentions with the operational reality of the startup. While civil and criminal laws provide "remedial" protection as a reactive measure, administrative procedures are proactive and foundational. In emerging economies like Algeria, these mechanisms have been updated to reduce the bureaucratic friction that often stifles innovation.

3.3.1- The "Startup Label": This acts as a procedural catalyst under the national legal framework, particularly Executive Decree 20-254 of the 15 December 2020, establishing a national committee for granting the startup label. The "startup label," "innovative project" label, and "business incubator" label are the primary administrative tools that serve as a legal certificate attesting that the emerging entity is innovation-based and possesses high growth potential.

a) **Label Granting Procedure:** Applications are reviewed by a national committee of experts. This administrative "sieve" works to ensure that only genuinely innovative projects benefit from state protection and incentives.

b) **Legal Effects:** Once the enterprise obtains the label, it moves beyond the scope of general commercial law into a "preferential legal zone" that includes exemptions from corporate income tax (IBS), tax on professional activity (TAP), and other benefits and incentives, allowing the enterprise to reinvest its liquidity into further R&D and intellectual property protection.

3.3.2- The Role of National Intellectual Property Offices: Administrative protection for innovation is centered in two main bodies: the Algerian National Institute of Industrial Property (INAPI) for patents and trademarks, and the National Office for Copyright and Related Rights (ONDA) for software and artistic works.

a) **Simplifying Filing Procedures:** To address the "practical challenges" of cost and complexity, administrative reforms have introduced digital filing systems, allowing startups to secure a "certain date" for their inventions without the need for extensive paperwork.

b) **Technical Examination and Opposition:** The administrative process includes a period during which the "prior art" is examined. Prior art is all technical or scientific information made available to the public anywhere in the world, by any means (written, oral, or by use), before the filing date of a patent application. This provides a window for the startup to defend the novelty of its innovation against administrative objections before reaching the more costly judicial litigation stage.

3.3.3 - Integration with the National Investment Fund (FNI): A unique feature of the current legal engineering landscape is the direct link between the "administrative label" and financial liquidity. The Fund requires proof of intellectual property filings as a condition for disbursing funds, thereby compelling enterprises to adopt a "protection first" culture.

a) **Direct Financing:** The "startup label" grants preferential access to the Startup Support Fund (ASF) and the National Investment Fund (FNI).

b) **A Continuous Path from IP to Funding:** Administratively, these funds require proof of intellectual property filings as a condition for disbursing support funds. This procedural requirement pushes enterprises to adopt a "protection first" option to ensure public money is invested in legally secured assets.

3.3.4- Customs and Foreign Trade Procedures: For enterprises that import high-tech components or export digital services, the Investment and Finance Laws provide for customs procedures via a "fast track".

a) **Temporary Admission:** Innovations involving physical prototypes can benefit from administrative regimes that exempt research equipment from customs duties.

b) **Facilitation of Foreign Exchange Controls:** Administrative circulars have been issued to help startups pay for international digital services like Amazon Web Services (AWS) credits or international patent filing fees through simplified exchange procedures, solving a significant "practical challenge" in cross-border innovation.

3.3.5- Grievance and Administrative Appeal Mechanisms (Azizi Jalal, Marzouk Wahiba, 2023)**:** If an administrative body, such as the label granting committee or INAPI, rejects an application, legal engineering activates administrative appeal tools.

a) **Appeals Committee:** Startups can appeal technical decisions before a specialized administrative committee, such as the National High Committee for Investment-Related Appeals provided for in Article 11 of Investment Law 22-18. This is a crucial "procedural guarantee" that ensures innovative projects are not stifled due to a misunderstanding of the technology by the administrative body.

b) **Judicial Review:** If the administrative appeal fails, the enterprise can escalate the dispute to a specialized court, relying on the doctrine of "legitimate expectations"

to argue that the rejection was arbitrary or lacked a legal basis, in accordance with the provisions of Article 12 of the Investment Law.

3.4- Application Challenges: The phenomena of patent thickets and financial barriers emerge as discriminatory factors at the "friction stage." The resource inequality between a startup and a large corporation leads to difficulty in enforcing protection. The prohibitive costs of international litigation and the gap in technical expertise within the general judiciary can render protection "theoretical" rather than "practical». In the final analysis of legal engineering, we must confront the "friction stage", the gap between theoretical legislative structures and the harsh operational reality that startups face. While the law provides tools for protection, the asymmetry of resources between a fledgling startup and a stable multinational corporation often makes enforcing these protections exceedingly difficult.

3.4.1- Patent Thickets and Freedom to Operate: A "patent thicket" refers to the dense and overlapping network of intellectual property rights that forces innovators to seek licenses from multiple sources to commercialize a single technology. Freedom to Operate, one of the most important legal and technical concepts in intellectual property, especially when launching a new product, is the legal assessment conducted to ensure that the manufacturing, sale, or use of a specific product does not infringe on intellectual property rights, such as patents owned by others in a specific market.

a) **Blocking Effect:** For a startup in fields such as telecommunications, biotechnology, or artificial intelligence, it is almost impossible to innovate without unintentionally infringing on an existing patent. This creates a "practical challenge" where the focus of legal engineering shifts from protecting the enterprise's own ideas to defending against infringement claims filed by others.

b) **Patent Trolls ("NPEs"):** Startups are often targeted by "Non-Practicing Entities," which are companies that do not manufacture products but exist solely to sue others for patent infringement. For a startup, even a frivolous lawsuit during a "Series A" funding round can be fatal, as investors avoid entities with "cloudy legal titles" or those facing pending litigation (Fabian Gaessler, Dietmar Harhoff, Stefan Sorg, Georg von Graevenitz, 2024).

3.4.2 - "Cost of Entry" vs. "Cost of Defense": The financial barrier represents perhaps the most significant obstacle in the innovation ecosystem.

a) **Global Filing Costs:** Although the Patent Cooperation Treaty (PCT) defers costs, the subsequent "national phase" requires writing and registration fees, local agent fees, and maintenance taxes in each country. A startup may possess a brilliant innovation but lack the cash required to secure a global patent portfolio.

b) **Litigation Asymmetry:** Studies have shown that in the United States or Europe, a typical patent infringement trial can cost millions of dollars. A large company can "wear down" a startup through litigation simply by extending the

"discovery phase," which drains the startup's cash reserves, regardless of the legal merit of the case.

3.4.3 - The "Enforcement" Gap in Emerging Economies: In the national jurisdiction, although Law 22-18 provides a strong framework, the "practical challenge" lies in the specialized knowledge of the judiciary.

a) **Technical Complexity:** Judges in specialized commercial or general courts face difficulties in grasping high-level technical disputes, such as software algorithms or molecular chemistry, which leads to unpredictable rulings, undermining the "doctrine of legitimate expectations".

b) **Administrative Delays:** Despite the state's reforms in comprehensive digitalization, the "time to protection" may remain slow. In fast-moving digital technology sectors, waiting 18 months for a trademark or 3 years for a patent may mean that the technology has become "obsolete" by the time the legal label is granted (Samuel Adomako, Mai Dong Tran, 2026).

4.4.3 - Strategic Countermeasures in Legal Engineering: To face these challenges, specialized legal scholars recommend several strategies based on "Lean Legal":

a) **Defensive Publication:** If a startup cannot afford patent costs, it can resort to the mechanism of publishing the idea, thereby placing it within the "prior art," which prevents any competitor from registering a patent on it in the future and ensures the startup its own "freedom to operate".

b) **Intellectual Property Insurance:** Some startups now resort to purchasing specialized insurance policies that cover the legal costs of defending their intellectual property or suing infringers.

c) **Collaborative Intellectual Property Pools ("Patent Pools"):** Startups in the same sector may join "patent pools" or contribute to open-source projects with licenses like the "General Public License" (GPL) to create a shared defensive perimeter against predatory large corporations (Jason M. Schultz, Jennifer M, 2013, pp. 1-67).

Conclusion:

This study concludes that the legal protection of innovation is not merely a procedural or bureaucratic requirement, but a strategic pillar for the startup's survival and continuity. To bridge the gap between the legislative structure and practical challenges, the study has proven that "legal engineering" represents the vital link connecting the creative spark to the sustainable commercial entity. By activating the multi-layered protection system and utilizing civil, criminal, and administrative mechanisms, startups can mitigate the risks inherent in innovation-based economies, particularly the emerging ones.

However, it is essential that the "legislative structure" remains in constant evolution to support future generations of young entrepreneurs. Policymakers must focus on the following elements, which we believe to be of priority:

Judicial specialization should be strengthened to ensure the efficient and competent adjudication of complex intellectual property disputes, particularly those involving emerging technologies and innovative business models. In parallel, the role of the National Investment Fund should be expanded to cover the prohibitive costs associated with international intellectual property filings, thereby enabling startups to secure protection for their innovations in foreign markets.

It is also essential to promote a culture of "Intellectual Property Awareness" so that legal protection is not perceived as a financial burden, but rather as an essential investment in the startup's "intangible capital" and long-term competitiveness. Furthermore, intellectual property registration procedures should be simplified through the implementation of a "fast-track" examination system for patents owned or developed by startups. The financing potential of intellectual property should likewise be enhanced by encouraging the use of intellectual property rights as in-kind collateral for obtaining bank loans and venture capital. In addition, legal awareness should be institutionalized through the establishment of legal clinics within business incubators, where founders can receive practical training on conducting "freedom-to-operate" analyses and identifying potential infringement risks at an early stage. Finally, specialized commercial courts should be established or strengthened to address complex technological disputes through judges with appropriate expertise in intellectual property and innovation-related matters, thereby improving the quality, speed, predictability, and effectiveness of judicial protection available to startups.

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