**INTRODUCTION**

“AI is the new electricity. I can hardly imagine an industry which is not going to be transformed by AI.” said Andrew Ng, CEO, Landing AI and deep learning.AI, California, US, speaking via video call. The emergence of the artificial intelligence revolution has brought unprecedented challenges to today's ethical standards, legal rules, social order and public management systems. It not only conflicts with the existing legal order, but also highlights the defects of the supply of legal system products, and even subverts the legal cognition that we have formed. In terms of Patent law, the main challenge is the patent eligibility of the artificial intelligence invention.

In this article we argue that the regulation of Intellectual Property (IP) protection should go beyond the traditional regulatory models and follow a more flexible regulatory framework. Considering the range of industrial needs and developments, the article develops a differentiated Community IP protection model that could stimulate growth and innovation, alter the behavior of patent users, and improve the quality of patents through spontaneous harmonization and convergence. To explain the model better, we distinguish two key elements: differentiated framework directives and epistemic patent communities. Differentiated framework directives dictate the establishment of general patentability standards at the EU level but allow national patent systems to set up stricter patent standards for particular subject matters at the national level. In this way, differentiated framework directives should lead to an appropriate balance between the principles of the IP protection regime and the ideals of economic integration. However, given the current diversity in innovation developments and industrial operations, we recognize the risk that not all IP stakeholders would agree to a differentiated Community IP protection model. To overcome the risk of deadlock within model negotiations, and to encourage the integration of countries that want to move forward and advance certain innovation developments, we propose the creation of epistemic patent communities. In this article, epistemic patent communities are perceived as strong mechanisms for establishing an inclusive patent protection environment that encourages various stakeholders to agree on certain patentability principles and to acquire better IP protection at the EU level. The rationale for European intellectual property rights (IPRs) and particularly patents is that they should stimulate innovation among various stakeholders and contribute to its broad dissemination.

The stimulation of growth and innovation relies on improving patentability standards and enhancing access to new inventions. As such, the establishment of an effective patent system is crucial. The effectiveness of an IP protection regime is determined by its ability to adapt to the needs of the knowledge-based economy , be equally accessible, and provide legal certainty (Pottelsberghe, 2009). Europe has tried to find a basis for an effective patent system through the European and the Community patent systems. Whereas the European patent system was established by the European Patent Convention (EPC), and governed by the European Patent Office (EPO), to establish a centralized patent granting process; the Community patent system was initiated by the European Commission to foster the long-term goal of creating a unified IP protection regime as part of a move toward an undifferentiated, one-size-fits-all IP protection regime throughout the EU.

Within the European patent system, the regulation of patentability issues has followed the traditional territorial principle in which national authorities are free to determine the scope and the interpretation of patents. Even though the European patent system has led to uniform patent granting conditions, the substantive terms of protection (the interpretation of the patentability standards and the enforcement of patents) fall under the authority of the national patent systems, which are similar but not identical across the EU (Piotraut, 2004; Ullrich, 2006). For an invention to be granted a patent it

should be new at the time of patent filing (i.e. novel), involve an inventive step that is not obvious to a person skilled in the art (non-obviousness), and generate useful outcomes (industrial applicability) (Langinier and Moschini, 2002; Tödtling and Trippl, 2005). In addition to these standard requirements, patent examiners also have to determine the extent to which a particular subject matter is patentable. However, since National Patent Offices (NPOs) have failed to come to a mutual recognition and application of these concepts, the EPO’s Contracting States2 continue to apply divergent patentability rules that have resulted in patents of unequal values, dubious quality, and high levels of legal uncertainty. Conversely, the proposed Community patent regulation emphasizes that the main purpose of the system is to contribute to realizing a single market and a common IP protection regime, with a unified patent throughout the Union that will be granted, regulated, and allowed to fall only in respect of the whole Union (Ullrich, 2002; 2006). Moreover, the Community patent system opts for a patent law that could be applied to any new technology. The IP protection principles behind this proposal have created many controversies within EU Member States (both industrialized and less developed countries). Since countries differ in their income levels, innovation preferences, and abilities to secure appropriate innovation and technological investments, it is difficult for them to agree on a unified approach to IP protection. They fear that such an approach might lead to a monolithic and centralized system that would discourage inputs from certain technology experts and industry leaders, and might be optimized only for some industries that would benefit the most. Recent industrial and technological developments (such as in the fields of biotechnology and computer software) have dramatically impacted on the growth of patent applications and on the debate over IPRs. This reflects the inability of the granting agencies and patent examiners to apply existing patentability standards to these innovative dynamics. While IP protection legislators provide the basic patentability standards that countries need to follow, they fail to adopt them to the new industrial needs. Recent developments in innovation highlight the fact that new patentability issues (e.g. scientific inventions) and actors (i.e. research institutions, universities) have entered the patentability area, and that these challenge the applicability of the existing standards. Since some inventions are the result of cumulative scientific work (e.g. the science-based, pharmaceutical-related inventions) they do not fit easily within the traditional patentability standards and regulatory frameworks that have been applied to other subjects. Science-based inventions are developing faster than Community legislation and show the need to improve both the governance and the regulatory framework of the existing IP protection regimes, while providing a more inclusive environment that recognizes the contributions of various stakeholders and experts.

The regulatory framework and the governance of IPRs within Europe remain crucial to the innovation policy because they provide the basis as to whether a particular subject matter is patentable, and determine the boundaries (the products and the processes) in which patent holders can exercise their patent rights. Moreover, an understanding of the IP protection regulatory framework and governance provide incentives for patent examiners to adapt the IP regimes to the patenting trends in various fields and sectors. Political scientists approach the concept of regulatory frameworks, and particularly the concept of governance, from different points of views: as a regulatory approach, an actor-based approach, or as an institutional approach (Borrás, 2003; 2006). These approaches coincide with the principles behind the traditional governance model according to which the regulatory policy frameworks are established by political communities that are constituted on the basis of specific political institutions at national or sub-national level, and governance is perceived as a concept of command and control by the state. This article goes beyond the traditional regulatory models and follows a more flexible understanding of IP protection regimes. We would argue that since patents reflect the existence of a system that operates at the public-private divide3, the regulatory framework of these IPRs needs to go beyond the formal rules of regulation, and focus on the effective inclusion of different systems, stakeholders, networks, and market interactions among the public and private sectors. Such an approach would lead to a hybrid regime that is collectively enacted within the society.

As noted earlier, within the area of IPRs, the EU has continuously tried to establish a uniform regime built upon common regulations. However, the inability of the Community to achieve a collective agreement and understanding of IP protection principles has led the issue of the EU patentability regulatory framework to an impasse. As a result, many issues remain unresolved, such as: how new technological developments can be incorporated within the existing IP protection regulatory frameworks in Europe; to what extent should Contracting States be able to control the operations of the patent standards within their territories; how to establish an inclusive IP protection regime that would balance the tasks between the Contracting States and the EU. By focusing on the evolution of the regulatory framework for IPRs, and specifically on patents, this article examines these questions in detail, and proposes a more flexible, sector-specific patent regime that would build upon differentiated adjustment strategies. A regime that would stimulate both growth and innovation, while bringing together experts from various fields to clarify the mission of the IP protection regime and improve the quality of patents through natural harmonization and convergence. The article is organized as follows. The next section highlights the main factors that affect the ability of the European patent system to provide an appropriate basis for IP protection and innovation development.