

Understanding the manifold approaches that shape research, development and innovation policies¹

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Abstract: This study examines the intersection of intellectual property (IP) law, social systems theory and ethical considerations in shaping sustainable research, development and innovation (RDI) policies. It highlights how IP rights incentivize innovation while simultaneously raising ethical concerns and issues of distributive justice, particularly in the context of access to technology and essential goods. The research explores the role of ethical frameworks—including utilitarian, deontological and Rawlsian perspectives—in addressing these tensions and argues for a balanced approach that aligns private incentives with societal welfare. Social systems theory provides a valuable lens for analyzing how cultural, economic, social, and strategic capitals interact to influence RDI sustainability. Case studies in biotechnology, pharmaceuticals and digital innovation illustrate the real-world implications of these interactions. The study further considers regulatory mechanisms, such as compulsory licensing and ethical constraints in patent law, as tools to mitigate inequities in access to innovation. Ultimately, the research underscores the

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need for an integrated, ethically grounded legal framework that fosters both technological advancement and social justice in global RDI policies.

Keywords: *ethics, IP law, patents, RDI, social systems theory, sustainability*

1. Introduction

Research, development and innovation (RDI) are pivotal drivers of economic growth, technological advancement and societal progress. As nations and organizations strive to address complex global challenges, the formulation and implementation of effective, and sustainable, RDI policies have become increasingly critical. These policies not only determine the direction of scientific and technological advancements but also influence the equitable distribution of benefits across societies. However, the interplay between intellectual property (IP) law, social systems and ethical considerations is not as well understood and it is difficult to map out in practical terms, which complicates efforts to develop a sustainable RDI framework. This article seeks to explore these intricate relationships by offering a comprehensive analysis of how IP law, social systems theory and ethical principles intersect to shape RDI policies, with a particular focus on sustainability and distributive justice. The main research question of this work is to what degree and extent do IP law, social systems theory and ethics interact with each other to ensure the sustainability of RDI policies?

The fundamental role of RDI in modern economies is well established, with the *Frascati Manual* defining research and experimental development as “creative and systematic work undertaken in order to increase the stock of knowledge” (OECD, 2015). However, the mechanisms through which societies incentivize and regulate innovation raise important questions about access, equity and ethical considerations (Chochia and Sicat, 2023; Göksal *et al.*, 2024).

Ethics and morality are often conflated in considerations of the patentability of inventions,² or the registrability of trademarks, designs, etc. more broadly.

² Recital 39 of the ‘Biotechnology Directive 98/44/EC’ states “whereas *ordre public* and morality correspond in particular to ethical or moral principles recognised in a Member State, respect for which is particularly important in the field of biotechnology in view of the potential scope of inventions in this field and their inherent relationship to living matter; whereas such ethical or moral principles supplement the standard legal examinations under

However, it is important to differentiate between terms such as ethics, morality and law because they are often confused for one another:

- *Ethics* is a branch of philosophy which is concerned with promoting good within a society. It should be noted that classic ethics models, such as utilitarianism (concerning ethical acts which bring the greatest good to a maximum number of people) and the Kantian model (which emphasizes certain rights of individuals that are considered inviolable regardless of good intent) can result in different conclusions (Ray, 1996, pp. 47–48).
- *Morality*, on the other hand, is universal in nature, an autonomous belief in right and wrong. It is independent of any philosophical rationale. It espouses beliefs such as “it is wrong to kill” and “one should always be honest”. In effect, if ethics is the metaphor for the wall, morals are its building blocks, and philosophy the mortar which holds it all together. (Ray, 1996, p. 49) Law is a controlling mechanism designed to restrict the actions of others by invoking the fear of punishment. This degree of coerciveness is what makes law distinguishable from both ethics and morality and hence, a legal standard is very different from an ethical or moral standard. (Ray, 1996, pp. 50–51)

In practice, ethics and morality affect law and legal decision-making, often via heuristic approaches adopted by those applying the law (both citizens and the judiciary). Interestingly enough, these are not limited only to common law but there is a broad practice of apparently well-functioning heuristic patterns among judges in Western legal systems as well (Hoffmann, 2020).

The intellectual property system, while designed to stimulate innovation through temporary monopoly rights, can create tensions between private incentives and the public good (Stiglitz and Greenwald, 2014). Recent academic discourse has highlighted the growing importance of ethical considerations in RDI policymaking, particularly in sectors such as biotechnology, artificial intelligence and pharmaceuticals (McMahon, 2021; Tvedt and Forsberg, 2017). These concerns become especially pronounced when considering the global distribution of innovation benefits and their potential impacts on developing nations (Forsberg *et al.*, 2018). The traditional justification for strong IP protection—that it drives innovation and economic growth—must now be balanced against broader societal concerns about access to essential technologies and medicines.

Social systems theory provides a valuable framework for understanding these complex interactions. Building on Parsons’ (1964) foundational work

patent law regardless of the technical field of the invention.”

on social systems, contemporary researchers have developed more nuanced models that incorporate multiple capitals—cultural, economic, social and strategic—in analyzing innovation systems. These approaches help clarify how different societal subsystems interact to either facilitate or impede sustainable innovation. The ethical dimensions of RDI policies have become increasingly prominent in policy discussions, particularly in the context of emerging technologies. As Drahos (2011) notes, the patent system’s original value-neutral approach has been challenged by developments in biotechnology and other fields that raise fundamental questions about human dignity and commodification of life. This has led to the incorporation of ethical considerations into major legal frameworks, such as Article 53(a) of the *European Patent Convention* and the EU ‘Biotechnology Directive 98/44/EC’. The relationship between ethics and IP law is particularly complex in the context of global health challenges. The COVID-19 pandemic has highlighted the need to reconcile patent protection with public health imperatives, echoing earlier debates on access to essential medicines in developing countries (Abbott and Reichman, 2020). These tensions reflect broader questions regarding the balance between incentivizing innovation and ensuring equitable access to its benefits.

Current research increasingly recognizes the need for a more integrated approach to RDI policy that considers both traditional economic incentives and its broader societal impacts. This includes attention to the United Nations’ Sustainable Development Goals (SDGs) and the concept of responsible research and innovation. Such approaches seek to align innovation policies with societal needs while maintaining sufficient incentives for private-sector investment in research and development (R&D). This article contributes to the existing literature by proposing a novel framework for understanding the interaction between IP law, social systems theory and ethics in RDI policy. Building on previous work in these areas, we examine how different theoretical perspectives—from utilitarian approaches to deontological ethics—influence policy choices and their outcomes.

Our analysis particularly focuses on the role of different capitals within the social system and their relationship with Sustainable Development Goals. The methodology employed in this study combines theoretical analysis with practical policy considerations to examine how different jurisdictions have attempted to balance competing interests in their RDI frameworks. Special attention is paid to emerging challenge areas where ethical concerns increasingly influence policy choices, such as biotechnology, digital innovation and pharmaceutical research. This investigation is particularly

timely, given the growing recognition of the need for more sustainable and equitable innovation systems. As societies grapple with global challenges such as climate change, public health crises and technological disruption, understanding how to craft RDI policies that promote both innovation and social justice becomes even more important. The article aims to contribute to this understanding by examining the complex interplay between legal frameworks, social systems and ethical considerations in shaping innovation policy.

2. Factors that influence RDI and a proposal to connect them

2.1 Relevant factors

The *Frascati Manual* defines R&D as comprising “creative and systematic work undertaken in order to increase the stock of knowledge—including knowledge of humankind, culture and society—and to devise new applications of available knowledge.” Innovation is defined as “putting new or significantly improved products on the market or finding better ways (through new or significantly improved processes and methods) of getting products to the market.” (OECD, 2015) Together, they are referred to as RDI.

The IP system incentivizes RDI activities by granting property rights which are, by design, limited in time. This incentivization presents two aspects: firstly, the pace and direction of research priorities in a given period and, secondly, the channelling of investments towards RDI activities that cater towards specific markets, where monopoly prices are paid for the respective R&D efforts (Tvedt and Forsberg, 2017, p. 161). Thus, for example, the patent system, by granting a 20-year monopoly to the patent holder, allows the holder to commercialize the fruits of their RDI by licensing (for a price of their choice) the invention to third parties for their use and includes the potential control of downstream use (McMahon, 2021, pp. 529–531).

The IP system (and patents in particular) is essential for the integration of science into industrial production. Although not quite as dramatic as Marx’s prediction of all sciences being pressed into the service of capital, such “IP based knowledge commerce” can restrict access to scientific knowledge and the resultant goods and services (Drahos, 2011, p. 345). From a cultural and social viewpoint, IP regulation in developed countries is often more advanced

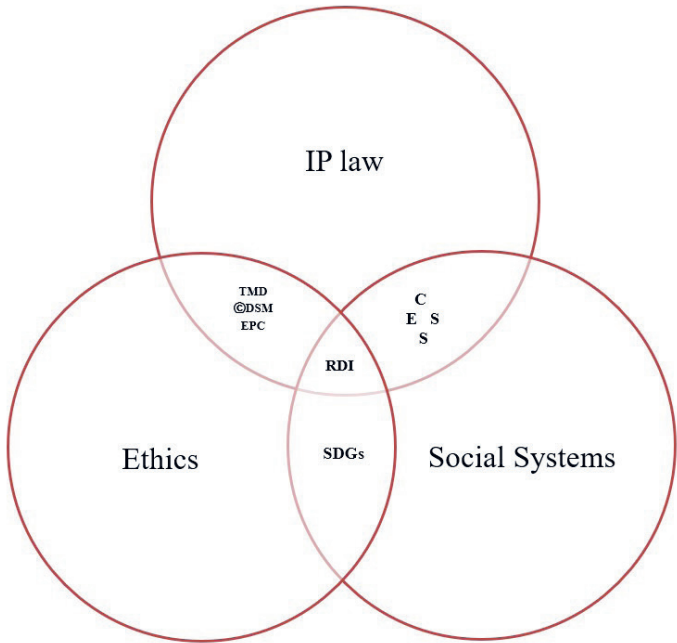


Figure 1. Interrelation of IP law, social systems theory and ethics.

Note: CESS—Cultural, economic, social and strategic capitals; TMD—‘Trademarks Directive 2015/2436’, ‘Trademark Regulation 2017/1001’; ©DSM—‘Directive on copyright and related rights in the Digital Single Market 2019/790’; EPC—*European Patent Convention*, 1973.

than in developing countries, thereby impacting distributive justice to the detriment of the developing nations (Forsberg *et al.*, 2018, p. 12).

The concept of sustainability of RDI takes us into the realm of the 17 Sustainable Development Goals (SDGs) as devised by the United Nations (UNDP, no date). To wrap the above discussion into a theoretical context, one can use various benchmarks, with social systems theory representing one particularly interesting option (Dutt *et al.*, 2021, pp. 89–109). A further aspect that takes into account ethical and moral dimensions in RDI can be observed in form of “data altruism” as envisaged, for example, within the *European Strategy for Data* (European Commission, no date) in the *Data Governance Act* (‘Regulation (EU) 2022/868’, 2022), which in its Article 2(15) defines its central element as “voluntary”—that is, data holders share their non-personal data without seeking or receiving a reward, which makes moral or ethical motivations their main driver (Tropp *et al.*, 2022).

2.2 Proposal

As stated above, IP law, social systems theory and ethics play a very important role in defining the course of sustainable RDI policies. In an attempt to study their interaction among themselves and to express their interplay with each other, the authors have mapped the practical terms of this relationship as follows.

3. The interaction between IP and social systems in the context of RDI

3.1 IP law and RDI

To ensure inventiveness and innovativeness, it is imperative that societies adequately reward those who indulge in research, development and innovation. There are several theories devoted to this subject and one of the key variants is a well-functioning IP rights (IPR) system. Such a system should be designed to provide smooth and seamless IP registration as well as effective enforcement of the granted rights (Dutt *et al.*, 2019).

IP law encompasses primarily trademarks, patents, copyrights and designs. An efficient IPR system not only enables the protection and commercialization of the outputs of RDI (at national and international levels), but it also has relevance to the attainment of the UN SDGs (Dutt *et al.*, 2019, p. 191).

3.2 Social systems theory and the concept of sustainable RDI

Parsons explained a social system as follows:

a social system consists in a plurality of individual actors interacting with each other in a situation which has at least a physical or environmental aspect, actors who are motivated in terms of a tendency to the “optimisation of gratification” and whose relation to their situations, including each other, is defined and mediated in terms of culturally structured and shared symbols. (Parsons, 1964, pp. 5–6)

This concept was further expanded upon by Groen *et al.* (2002), who introduced a model (hereafter known as the 4S Model) comprising four concepts—scope, scale, skill and social networking—to the above-mentioned social system. The model was designed to target the R&D activities undertaken by companies

under the auspices of state-sanctioned policies, which directly impact diverse capitals such as culture, economics, social mores and strategy. The recognition, preparation and exploitation of opportunities are considered to be the defining moment when a social system achieves sustainability, both in terms of creation of value and the development of the above-listed four capitals (Groen *et al.*, 2002, pp. 3–4; Dutt *et al.*, 2019).

4. The important role of ethics in RDI

4.1 The interplay between RDI, IPR, ethics and morality

Research has shown that incentives for innovation are directly proportional to the price of innovative products (Sonderholm, 2010, p. 3). Thus, incentivizing RDI through IP law has proven an effective strategy (Ferraro *et al.*, 2017; Dutt *et al.*, 2018).

Some researchers argue that weak protection of IP enables developing countries to imitate and thus cheaply acquire technologies (especially those which lack competition or are not easily substitutable). It also prevents patent abuse through non-disclosure of all the working aspects of an invention. This prevents preservation of market share through the accumulation of “sleeping patents” by monopolists (whose sole intention is to limit the rate of technological change). Sequential and complementary innovation, coupled with strong IP protection, can potentially delay commercial exploitation and hinder technical innovations, especially when global R&D is conducted on a small scale. Conversely, other researchers state that strong IP protection stimulates innovation in fields such as medicines and chemicals. New inventions have a short commercial life and only strong IP protection can guarantee profits. Strong IP protection also facilitates foreign direct investments and frontier technology transfers from the global North to the South, while preventing piracy of IP and resultant trade disputes. (Kanwar and Evenson, 2003, pp. 237–239)

However, it should be noted that the *Universal Declaration of Human Rights* as well as the *EU Constitution* and its *Charter of Fundamental Rights and Freedoms* state that human rights are moral rights. Thus, all EU laws (including IP laws) that violate human rights or human dignity are void. Such is also the case with the ‘Biotechnology Directive 1998/44/EC’, which provides in its recitals (16, 38, 39, etc.) and articles (6, 16, etc.) that protection of human rights and human dignity, in addition to ethical

and moral principles, must guide the patentability of inventions (Adcock and Beyleveld, 2016, p. 1).

Fundamental rights, such as freedom of expression, in the broad sense, and conducting of business, in the narrow sense, also play an important role in this context, since trademark law and EUIPO's judicial decisions must comply with the standards prescribed by the *Charter of Fundamental Rights*. Hence, under Article 7(1)(f) of the 'Trademark Regulation 2017/1001', the rights of traders to register words and images as trademarks are balanced against the right of the public to avoid being disturbed, abused, insulted or threatened by trademarks (Geiger and Machado Pontes, 2017, pp. 17, 24–26).

In the field of biotechnology, for example, initial investments in RDI carry extremely high levels of risk and the only means of recouping profits is through securing monopolistic patents on successful products. Such patents are intended to cover the costs of RDI incurred not only for drugs that are successful, but also those that are non-successful, while also providing for future investments in RDI. However, this pursuit of profit cannot absolve business enterprises of the ethical responsibility of undertaking some form of charitable action, however small, in the quest for achieving a "just social order", as espoused by Nagel (Carbone, 2003, pp. 213–214).

IPR in pharmaceutical products can potentially exclude certain classes of buyers, either by excluding those who cannot afford expensive medicines or by creating roadblocks to access essential drugs. Furthermore, RDI in relation to drugs for diseases that are mostly found in poorer countries (e.g., Ebola, malaria, etc.) is limited for commercial reasons (due to lack of economic incentives), thereby resulting in availability problems (Sonderholm, 2010, p. 3).

The ethical issues related to IPR are especially fraught when they relate to medicinal products and genetically modified agricultural produce which may be termed as socially valuable goods. Compulsory licensing of drugs, in public emergencies, can help mitigate such ethical concerns by increasing the availability of drugs. Yet, such measures can reduce the appetite of the private sector for groundbreaking RDI or increase the risk of diminished foreign direct investments or retaliatory trade sanctions against countries that issue compulsory licenses (Sonderholm, 2010, pp. 1, 4, 6).

The Boards of Appeal of the European Union Intellectual Property Office (EUIPO) have held that trademarks may be immoral or contrary to public

order under Article 7(1)(f) of the ‘Trademark Regulation 2017/1001’ if they are perceived to be insulting, discriminatory, subjecting to ridicule or violating one’s sexual self-determination. Public policy was understood to cover EU law, treaties and secondary EU legislation. Similarly, ethical and moral principles are shaped also by the historical context and the case-law of Member States. The applicable standard for evaluating the relevant public is that of a reasonable individual, assumed to have normal levels of sensitivity and tolerance (Geiger and Machado Pontes, 2017, pp. 6–7, 9).

4.2 Ethical perspectives

Ethical theories fall predominantly into two categories: consequentialist, which consider the consequences of decisions based on moral problems, and deontological, which depend upon pre-existing rules or principles (Drahos, 2011, pp. 349–350).

In the context of the patent system, it should be noted that patents were originally geared towards a value-neutral approach as far as ethical perspectives were concerned (under the general rule that all technical inventions—good or bad—should be patentable). The normative approach was that there existed another set of laws and regulations (e.g., criminal laws, family laws, etc.) for considering the ethical ramifications of science and innovation. This approach changed with the advent of biotechnology (and the resultant discussions centering around the so-called “patents on life”). At present there is greater emphasis on concepts such as *ordre public*, morality and practices which call for responsible research and innovation in RDI (Tvedt and Forsberg, 2017, p. 161).

No standardized approach towards ethics exists in biotechnology. Instead, the field is shaped by a wide spectrum of general ethical theories (utilitarian, deontological, ethics of care and justice-based approaches) as well as specific principles based on precaution and sustainable development (Forsberg *et al.*, 2018, p. 5).

Some scholars have elaborated on the following ethical perspectives in the fields of RDI (Tvedt and Forsberg, 2017, pp. 161–163):

Table 1. Ethical perspectives in the fields of RDI.

Ethical perspectives	Ethical considerations
Deontological perspective	Moral acceptability of certain types of biotechnology-related patents and their impact on other beings often comes first, notwithstanding the worthiness of the end goals (Tvedt and Forsberg, 2017). The ethical debate concerning the right to patent parts of human beings (and its correlation with human rights, dignity and sanctity of life) touches upon deontological concerns regarding ownership of living beings (Forsberg et al., 2018, p. 9).
Liberal individualism (a rights-based approach)	Justification of ownership of biotechnological inventions is based upon the Lockean theory of appropriation wherein by mixing labor with nature, inventors can acquire a legitimate right of appropriation from the commons (Locke, 1690). This approach has been reflected in various legal systems, providing various forms of gratification to employees whose innovative contributions have resulted in inventions patented by their employers (Hoffmann and Prause, 2015). However, the natural rights theory of scholars such as John Locke, Robert Nozick and others are unable to truly support patents in biotechnology, even though scientists have a natural right of property in objects which they have invented with their own labor. This is because there is still the theoretical requirement of leaving “enough and as good” for others and “not making anyone else worse off”. Thus, patenting a gene which monopolizes all the fruits of the world is unlike harvesting some fruit for oneself (Drahos, 2011, pp. 349–350).
Utilitarian perspective	Herein exists a philosophical justification of the patent system, as a tool which helps society to develop, by contributing towards the maximization of benefits (and social goods) to society as a whole, rather than focusing on individual inventors (Tvedt and Forsberg, 2017).
Communitarian ethics	The focus is more on deeply embedded communal values, the common good, virtues of traditional knowledge, etc. found within social groups, instead of individual rights/dignities (Tvedt and Forsberg, 2017).
Rawls’ theory of justice	The maximum contribution to society by a legal system is sought to be assessed to improve the wellbeing of the most disadvantaged segment of that society (Rawls, 1971; Tvedt and Forsberg, 2017).
Discourse ethics perspective	True participation in democracy entails that the “decision making process” is open to everyone (Tvedt and Forsberg, 2017).

Interestingly enough, research has shown that utilitarian and rights-based perspectives dominate the actions of the executive branch of government. Deontology only plays a significant role when this approach is clearly mandated by the law. The discourse ethics approach is sometimes visible in the decision-making process, although Rawlsian and communitarian approaches are largely ignored. This could be attributed to the above-mentioned tendency within patent offices to focus on the invention itself rather than the potential impact that the patent, if granted, would have in the future (Tvedt and Forsberg, 2017, p. 174).

Strategy also plays a major role in the context of the patent system, since the leading countries in Western Europe and the USA, which are often seen as the biggest supporters of the patenting system, tend to do so due to its vital importance to state power rather than its usefulness as a public welfare enhancement mechanism. Nowadays, the patent system is increasingly sophisticated in nature and is generally seen as being optimized for large users (as a form of private taxation) rather than individual inventors (Tvedt and Forsberg, 2017, p. 174).

Ethical issues often arise in relation to patents and the associated pursuit of profit maximization. In the context of patents for medical inventions, it has been noted that these can potentially increase costs or limit supplies, resulting in a lack of access to essential medicines. Inventions involving biotechnology and artificial intelligence also raise questions related to their appropriateness and ethicality (McMahon, 2021, pp. 529–530). This is all the more jarring since ethical issues under patent law are often superficially dealt with, in comparison with medical law or bioethics, where ethical issues play a more substantial role (McMahon, 2021, p. 531).

4.3 Legal-ethical challenges under patent law

In Europe, the patenting of technologies that evoke ethical considerations may be generally challenged through four main legal instruments (McMahon, 2021, pp. 534–535):

Table 2. Challenges to ethical considerations in the patenting
of technologies.

<i>European Patent Convention</i> (1973)	Article 53(a) prohibits the patenting of inventions whose commercial exploitation would be contrary to <i>ordre public</i> or morality (McMahon, 2021, pp. 534–535). Although Article 53(a) of the <i>European Patent Convention</i> prohibits patenting of inventions which are contrary to public order or morality, it is seldom used to actually withhold patents for otherwise lawful inventions. Instead, the ethical objections to human gene patents deal more with issues such as commercial dominance and the resultant disparities in wealth and power among populations and nations. Human gene patents also trigger concerns about topics such as open discussions and accountability in the context of challenges to rights and opportunities of ordinary people (Lever, 2008, pp. 1–2).
'Biotechnology Directive 98/44/EC'	Article 6(2) specifically excludes patents on processes for cloning human beings or modifying their germline genetic identity, the commercial or industrial use of human embryos and modification of the genetic identities of animals in ways that likely cause suffering without any substantial medical benefits (McMahon, 2021, pp. 534–535).
<i>European Patent Office (EPO) Guidelines for Examination of Patents</i>	Patents are refused under rare and exceptional circumstances if the inventions are likely to induce riots, public disorder or lead to criminal or offensive behaviour. The criterion is whether the general public would view the invention with abhorrence (McMahon, 2021, pp. 534–535). In contrast to the EPO, some researchers claim that national patent offices have been compromised and no longer serve the national interest. Instead, their commercial model (of high fees for granting and renewing patents) incentivizes more patents being granted and, in turn, makes them subservient to the rentier network of private companies (Drahos, 2011, p. 347).
EPO decisions	The general view is that the EPO is neither a moral censor nor the appropriate authority responsible for ethical considerations, unless there is a clear social requirement (McMahon, 2021, pp. 534–535). Interestingly, one of the problems that is often encountered is the tendency of patent offices to narrowly interpret legal ethical exemptions. Through both multiple decisions and guidelines, the EPO has emphasized on higher thresholds regarding exceptions to patentability. This is very often based upon the argument that patent law should concern itself strictly with the ownership criteria of inventions, while leaving moral aspects of their use to other legal statutes. (Forsberg, 2018, pp. 14–16)

5. The connection between the various capitals of the social system, relevant SDGs and ethical considerations

Table 3. Capitals of the social system, relevant SDGs and ethical considerations.

Capital	Relevant SDGs	Ethical considerations
Cultural	4, 9, 10, 11 (Dutt <i>et al.</i> , 2021, pp. 103–104)	An ethical culture which recommends Waldron’s ‘Good Samaritan’ approach, whereby slight sacrifices for the better good should be encouraged (Carbone, 2003, p. 214). Gene-editing inventions, either somatic or germline, raise new ethical concerns, since ‘germline interventions’ can affect future generations (in unimaginable ways) or allow for the misuse of genetic enhancement technologies. This may also cause social unrest between those with edited genomes and the rest of the population. Legislations of different countries deal with these issues in a non-uniform manner, with some countries adopting more liberal policies while others remain more conservative in approach. Thus, germline genome editing technologies which are not used for reproductive purposes can be seen as harmless by some legal regimes, vis-à-vis the inheritable version of genome editing. (Feeney <i>et al.</i>, 2021, p. 3)
Economic	9, 12 (Dutt <i>et al.</i> , 2021, pp. 103–104)	Generating favorable publicity and goodwill by providing benefits (e.g., in the form of drugs developed through costly biotechnology) to marginalized/impoverished populations, if the outcomes exceed the limited costs (Carbone, 2003, p. 214). Inventive enterprises can engage in RDI to create IPRs which enable commercialization of the RDI efforts, thereby making IPRs a useful economic tool (Sonderholm, 2010, p. 2). Differential pricing (charging variable prices for different geographical regions) can be an attractive pricing scheme from an economic viewpoint, especially in the case of essential medicines, although their propensity to encourage parallel trade and smuggling from poor to rich countries can dampen such economic efforts (Sonderholm, 2010, p. 5).

		Technical progress in gene editing has given rise to interesting business arrangements between private parties. First, there is the traditional (and slow) regulatory route which must be followed by all parties. Second, there is the concept of ethical licensing of patented inventions through the use of ethical constraints in technology licensing agreements. While such private arrangements have advantages of being epistemic, global, flexible, enforceable in courts, etc., they are also hampered by being undemocratic, voluntary, unsustainable and often motivated by wrong reasons. A third way forward is the formation of a government-backed advisory committee which would guide the government's control of gene editing patents, thereby guaranteeing democratic legitimacy to such means of control. Or lastly, the amendment of international IP treaties such as <i>Trade Related Aspects of Intellectual Property Rights</i> (TRIPS) or the creation of a World Intellectual Property Organisation (WIPO) ethics advisory committee. (Feeney <i>et al.</i>, 2021, pp. 1–2)
Social	9, 10, 17 (Dutt <i>et al.</i> , 2021, pp. 103–104)	It is socially imperative that expanded patent rights should be reciprocated by ensuring the just administration of public-private interests. Enterprises have an obligation to contribute to building and maintaining social infrastructures which support the applicability of the products developed through their RDI efforts. The solutions to several medical issues plaguing poor countries can only be achieved by combining partnerships in the private and public domains and through multinational charitable activities to achieve a just social order. (Carbone, 2003, p. 215) An IPR is a socioeconomic tool, a temporary monopoly which enables an inventive enterprise to secure profitable RDI. An IPR can enable the correction of any market failure with regard to the undersupply of essential pharmaceutical drugs. (Sonderholm, 2010, p. 2) From a social viewpoint, differential pricing (as defined above) can also help societies overcome problems related to access to essential drugs and to promote social justice, although it may be socially unjust if well-off people in poor countries (and vice versa) get unfair advantages with regards to the same drugs (Sonderholm, 2010, p. 5).

		IPRs can be ethically justified by showing the link between incentivizing RDI to increase human welfare. Social utility of IPRs can thus be showcased through welfarism which enhances moral outcomes by stressing upon the maximization of future human welfare (and is therefore an important form of consequentialism) (Sonderholm, 2010, p. 11). In order to morally defend the consequences of the patent system, it is important to consider its impact on the entire population, both rich and poor. However, the lack of access of expensive patented medicines, plants, seeds, etc. shows that the patent system works well for rich countries rather than poor ones. Nor are patent norms superior to other forms of funding for stimulation of scientific research (such as government grants, prize rewards, etc). (Drahos, 2011, pp. 349–350)
Strategic	4, 9, 10, 17 (Dutt et al., 2021, pp. 103–104)	Case studies show that free delivery of “orphan” drugs to cure commercially unviable diseases in poor countries generates outsized, and yet strategically significant, publicity and goodwill for enterprises (Carbone, 2003, p. 214). It makes strategic sense for enterprises to ensure that private and public interests are ethically aligned so that the common good is achieved while patent protection is secured (Carbone, 2003, p. 215). It is also strategically beneficial for biomedical enterprises to indulge in (relatively low-cost) public health campaigns to raise awareness about certain diseases, providing flexible payment schemes for uninsured patients, reducing opposition to generic drugs, etc., to showcase their willingness to forge allegiances towards socially just goals and thereby garner positive public support for their wider RDI generation, protection and commercialization activities (Carbone, 2003, p. 215). The EU’s <i>Digital Services Act</i> has prompted some researchers to draw a distinction between the different approaches towards ethics. Hard ethics focuses solely on moral right versus moral wrong, without deference to any legislation. In contrast, soft ethics deals with post-compliance issues related to a regulation, outlining what is morally right or wrong in connection with that regulation and are not contrary to the said regulation. (Turillazzi et al., 2023, p. 100)

6. Conclusion

This study explored the intricate interplay between IP law, social systems theory and ethics in shaping sustainable RDI policies. While the IP system serves as a crucial incentive mechanism for fostering innovation, it also introduces ethical and distributive justice concerns, particularly regarding access and equity.

Ethical considerations further complicate the landscape by introducing divergent philosophical perspectives on innovation, ownership and access to scientific advancements. While deontological and rights-based approaches underscore the moral limits of commodification, utilitarian perspectives advocate for a balanced approach that maximizes social benefit. In the realm of biotechnology and pharmaceuticals, ethical concerns are particularly pronounced, necessitating regulatory mechanisms such as compulsory licensing, to balance private innovation incentives with public health imperatives. The study also highlights the role of different capitals—cultural, economic, social and strategic—in influencing the sustainability of RDI and demonstrates that ethical and legal frameworks must adapt to address emerging challenges such as gene editing, artificial intelligence and novel digital services.

Future research should investigate the implications of emerging technologies on RDI sustainability, with a focus on reconciling ethical principles with market-driven innovation. Comparative studies across jurisdictions can offer valuable insights into how different legal systems navigate the balance between IP protection and societal welfare. Ultimately, fostering sustainable RDI policies requires a nuanced approach that harmonizes economic incentives with ethical imperatives and social responsibility. The development of adaptive legal frameworks and the promotion of responsible innovation practices will be crucial in ensuring that scientific advancements contribute equitably to global development goals.

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