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Circular Economy: (Not So) Merry Go Round for Innovation and World Intellectual Property Regime

Hardik Daga and Latika Choudhary†
UPES, Dehradun, Uttarakhand — 248 007, India

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This study will investigate intellectual property (IP) issues that hinder or halt the implementation of closed-loop circular economies such as risk of knowledge[1] leakage, spill-overs, identification and articulation of IP in licensing agreements relating to recycled products etc. It will subsequently investigate the conceivable ramifications to the innovation ecosystem of the world, primarily India, due to concerns arising out of IP enforcement. It has been a long held belief that constructive IP regulations can contribute enormously towards the creation of sustainable development ecosystem, and therefore, the researchers will delve into innovative IP reforms, such re-defining the contours of intangible property in private law and methods avoid IP spill-over, leakage etc., which can help fill gaps on the path of creation of sustainable circular economy across the globe.

Keywords: Circular Economy, European Union, Intellectual Property, Innovation, Green Technology

The world's resources are harvested, used up, and then discarded because of the economy's reliance on a linear paradigm of production and consumption. Of the 100 billion tonnes of resources used annually, more than 90 percent are lost to landfills and incinerators.[2] Inefficient resource use drives pollution, climate change, and biodiversity loss. Extracting and processing resources accounts for 50% of carbon emissions and 95% of terrestrial biodiversity loss.[3] Hence, it is imperative to emphasize the necessity of implementing systemic alterations in the manner in which the human population harnesses and exploits natural resources. The imperative to transition into a circular economy (CE) arises from the confluence of environmental imperatives and economic prospects. On one hand, it is imperative to acknowledge that the global population is experiencing a rapid growth trajectory, thereby exerting significant strain on the utilization of natural resources.[4] While truth of the matter is quite the contrary as circular economy presents a worthy opportunity due to its substantial potential in facilitating the emergence of innovative business models.

The precise delineation of a circular economy remains subject to debate; however, it is commonly understood as a system that generates value by decreasing the need for new inputs and increasing the efficiency of existing ones through the slowing, closing, and narrowing of material and energy loops. Longevity in development, servicing, repair, reuse, remanufacturing, refurbishment, and recycling all contribute to this goal. The fulfillment of this objective can be achieved through several means. Firstly, by implementing design strategies that prioritize durability, the rate of material flow within the economy can be decelerated. This is accomplished by extending the lifespan of products, thereby reducing the frequency at which new materials are required. Second, avoiding non-renewable energy and materials helps natural systems regenerate. Additionally, renewable resources must be preserved or improved. Substituting fossil fuels with renewable energy and restoring soil nutrients promotes natural ecosystems. Furthermore, it is imperative to ensure that all materials circulating within the economy are non-toxic and pose no harm to individuals or the environment. Third, reducing of material flows can be accomplished by adopting a "more with less" approach. This entails altering consumption patterns in a manner that allows for the delivery of equivalent services with reduced material inputs. Strategies such as leasing, renting, and digitizing services contribute to this objective. Lastly, the integration of circularity principles necessitates the reintegration of materials into the economy at the conclusion of their life cycle. This can be achieved through various practices, including reuse, repair,

†Corresponding author: Email: lchoudhary@ddn.upes.ac.in

refurbishment, remanufacturing, and recycling. By implementing these measures, the circular economy can be effectively realized. The escalating supply-chain volatility and susceptibility to disruptions, stemming from heightened geopolitical tensions, the COVID-19 pandemic, and severe weather occurrences, have prompted various stakeholders, including governments, industries, businesses, and international organizations to acknowledge the circular economy as a practical means of accomplishing environmental objectives and mitigating the repercussions of supply-chain shocks.

The recognition of the circular economy as an imperative for effecting a transformative shift is steadily growing. In November 2022, the European Commission adopted measures proposed in their most cherished circular economy action plan.[5] Many rules exist with the objective of achieving carbon neutrality by the year 2050, such as on packaging, packaging waste, a biodegradable, and compostable plastics, eco-design for sustainable goods, garbage shipping, etc. Towards the same, a preliminary agreement for an EU Carbon Border Adjustment Mechanism (CBAM) on imported products such iron and steel, cement, aluminium, fertilizers, power, and hydrogen was reached in December 2022. The concept of circular economy is not new and Japan, so far as in 2000, had in place a legal framework for a circular society such as law for Establishing a Recycling-Oriented Society which established the principle of a waste hierarchy. Also, in the year 2001, the Law for the Promotion of Effective Utilization of Resources which required businesses to considerrecycling at the designing and manufacturing stages itself. This trend is diligently followed by developed nation currently.

From the outset, the policies to create a global circular economy give a rosy picture of reclaiming the clean environment but it will give rise to new problems. Restrictions on free trade due to measures like green border tax & achieving economies of scale, intellectual property issues of owning and sharing emerging technologies for manufacturing recycled products, competition distortion as the innovation ecosystem will consist of a very few giants of original equipment manufacturing sector. This certainly gives rise to a presumption that these policies will have extra-territorial impact on production operations in the developing countries since the global west is their major trading market. However, this research will be restricted to IPR issues related to circular economy.

IPR and Circular Trade- Pathbreaking or Catastrophe

Sustainable product innovation manifests as new, marketable goods that either individuals or businesses may use to begin more ethically sourcing their goods and services. Products like solar panels and LED lights address the environmental and economic dimensions of sustainability, while others, like the Dutch Fair Phone, try to address both.

Innovations in sustainable processes aim to improve manufacturing and management procedures so that they have a less environmental impact. Within the framework of the circular economy, which encourages recycling and upcycling, one example is the shift toward greater energy efficiency. While most process innovations are created and implemented inside a single company, sustainable process innovation often involves numerous companies working together throughout a value chain.

With regard to promoting and aiding the successful implementation of the circular economy, intellectual property rightsplay a vital role, a transformative economic model aimed at achieving sustainable resource management and reduced environmental impact. The circular economy seeks to get away from the linear "take-make-dispose" model by prioritizing resource conservation, waste reduction, and the continual recycling and reusing materials. In this context, IPR serves as a powerful driver of innovation and investment in circular technologies, processes, and products.[6] The protection of IPR, including patents, copyrights, and trademarks, encourages organizations and resourceful individuals to put money into R&D, which leads to creation of resource-efficient technologies and sustainable production methods.[7] Patents, in particular, offertime-limited monopolies that provide inventors and businesses with the confidence to recoup their investments and further develop their innovations.[8] This exclusivity encourages the development of cutting-edge solutions critical to the circular economy's success.

IPR also fosters collaboration and knowledge-sharing within the circular economy domain. By providing legal protection and recognition of ownership, IPR encourages businesses to engage in licensing and cross-licensing agreements, enabling the transfer of knowledge and accelerating the adoption of circular practices across industries.[9] IPR also plays a pivotal role in encouraging the "design for recycling" approach. By granting protection to

innovative designs and processes that enable easy disassembly, reuse, or recycling, IPR fosters the adoption of circular design principles across industries.[10] Manufacturers are thus encouraged to create products which could better achieve the sustainability goals of the circular economy.

IP Hurdles and the Circular Economy

Despite the fact that intellectual property supports the growth of circular economy business models that emphasize on resource efficiency and lifespan extension, it is essential to address prospective IPR challenges with regard to circular economy. The dissemination of knowledge and the development of circular technologies can be hampered by excessively restrictive intellectual property policies.[11] Critics argue that IPR, such as patents, trade secrets, and to some extent copyright, hinder the progress of sustainable development and create barriers to the swift distribution and adoption of novel concepts.[12] The following are the challenges.

Leakage of Knowledge

The term "knowledge leakage" refers to the unintentional spread of information that was originally meant to remain inside the confines of a corporation. This occurrence might therefore result in a competitive disadvantage.[13] The unintentional dissemination of information results in the imposition of expenses in the form of transactional and managerial fees, thereby dissuading enterprises from pursuing collaborative endeavours with external partners.[14] For example, BMW, a prominent German automotive company, has demonstrated its commitment to the circular economy by creating exclusive tools to enhance the efficiency of disassembly procedures. This endeavour draws from the company's internal expertise on product assembly techniques and the materials employed in their manufacturing processes. Nevertheless, the corporation now only disassembles a small portion of the automobiles it distributes worldwide, mostly because of the difficulties encountered in retrieving and collecting old vehicles that are spread across various geographical locations. Although third-party recyclers and refurbishers have the potential to address the recycling gap, it is possible that established manufacturers such as BMW may be hesitant to share their important knowledge and expertise with external entities. Consequently, this reluctance might result in the denial of access to proprietary intellectual property rights. BMW serves as a representative case study, although it is important to note that other firms in various industries, such as Apple and Nikon, exhibit comparable operational approaches.[15]

Possible Information Spillovers and Opportunistic Behaviour

This risk implies “that new knowledge, once generated, may be used by agents other than the innovator”[16], which may lead to a situation wherebyone actor derives a greater amount of benefit from a collaborative effort compared to its counterpart.[17] Consequently, organizations that engage in research and development collaborations[18], face opportunistic risks, wherein the sharing of information increases the likelihood of unintended spillover effects. The magnitude of this risk is directly proportional to the level of enforceability of intellectual property rights, with weaker IPRs amplifying the potential for involuntary spillovers.[19] This stands true for cooperative as well as co-petitive environments. Furthermore, among technology-based co-petitions, these opportunistic threats have the potential to give rise to co-petitive conflicts, so placing the coopetition at risk due to shared presumptions of malevolent motives.[15] Consequently, this results in the emergence of intricate contractual agreements within alliances[20] sojeopardizing the implementation of essential innovative technologies in areas such as recycling, refurbishing, and related domains.[21]

Ineffective IP Management and Strategic Thinking

Effective sharing of intellectual property necessitates the implementation of appropriate IP management strategies, particularly in competitive environment.[22] Effectively managing uncertainties associated with intellectual property poses a significant barrier in the widespread deployment of remanufacturing activities within the sector.[23] This is also argued by those who contend that “successfully implementing the circular economy also requires access to existing IPR assets through technology transfer”.[24] Hence, it is imperative for the successful execution of a circular economy that there exists coordination and cooperation among the stakeholders engaged in the supply chain, encompassing both the upstream as well as the downstream sectors. Nevertheless, the management of intellectual property rights presents uncertainties that might potentially impede the realization of the circular economy. The

lack of internal expertise and experience poses an additional obstacle for small and medium-sized firms when it comes to efficiently and strategically managing their intellectual property. This challenge becomes more pronounced when partnerships occur between partners with uneven resources and capabilities. Also, if the top management doesn't understand the idea of "corporate entrepreneurship," they might not give projects that fit with this idea, the importance they deserve. Consequently, they may allocate less resources towards research and development (R&D) activities aimed at fostering relevant innovations.[22] This difficulty is exacerbated when the environmental repercussions of linear economic models are not taken into account.[25]

Ambiguityon IP Ownership and Lackof Available Resources

An additional issue pertaining to intellectual property involves the ambiguity surrounding ownership of intellectual property rights.[26] The ownership of different parts of a recycled component becomes unclear when it involves intellectual property from multiple actors.[27] The aforementioned principle also extends to intellectual property in the form of data associated with specific equipment, which is shared and utilized by multiple users.In addition, new participants encounter the difficulty of possessing limited intellectual property rights assets, capabilities, and resources to distribute their IPRs. Companies often encounter challenges related to insufficient information, knowledge, technologies, and technical skills.[28]

Stringent IP Control Mechanisms

Firms demand IP protection to stay competitive.[22] Consequently, incumbent firms may opt to withhold access to their private intellectual property, impeding or even obstructing the general implementation of circular practices, rather than disseminating their valuable expertise to others.[26] It is noteworthy to mention that in the absence of legislative mandates, originalequipment manufacturer (OEM) exercise control over the extent to which third parties can engage in circular activities through their product designs.[29] The detrimental nature of this issue arises[30] from the significance attributed to collaborative product designs within the plans of enterprises aiming to effectively embrace the abstraction of circular economy. In addition, IP holders employ various strategies to mitigate opportunistic behaviour. These strategies include the implementation of license clauses[31], patent fences, and cross-licensing agreements. In addition, they utilize restrictive license agreements with their customers[25] or conditioned sales contracts, which may ultimately prohibit certain activities such as repairs, disassembly, and the use of non-OEM parts.

Ambiguity in Interpretations

There is much uncertainty pertaining to the extent to which end-of-life solution providers can indulge in circular activities without infringing patents.[16] This is a genuine rational fear as IP laws are “meant to preventively hinder reconstruction of protected work”. Indeed, refurbishing or remanufacturing might be perceived as a type of "replication" in a larger context. In the context of a legal suspension in a court of law, the central inquiry often revolves on whether the action in issue may be deemed as a kind product’s maintenance or repairing within its anticipated lifespan, as opposed to the creation of a patentable product.Once the activity is classified as a reconstruction or modification, it immediately is an infringement of the patent.

Achieving a harmonious equilibrium between safeguarding innovation and facilitating the dissemination of information is of utmost significance for the efficacy and triumph of circular economy endeavours. Moreover, the existence of patent thickets, characterized by the ownership of many patents pertaining to comparable technologies, can give rise to obstacles for new market entrants and impede the progress of innovation.It is imperative for policymakers to deliberate on strategies aimed at effectively addressing the issue of patent thickets and guaranteeing that intellectual property rights do not impede the progress of circular economy principles.

Towards Utilizing IPR to Promote the Transition to Sustainability: Additional Research and the Future

By raising an appetite to license and enhancing the function of patents as a knowledge repository, IPR may play a significant role in aiding the transition needed to transform industrial sectors towards sustainability through creative means of production. Better matching of the IPR with the present innovation demands of the manufacturing business can go a long way toward transforming the manufacturing sector. It is necessary to inquire into the kinds of cooperation modes which are most effective in driving sustainability transitions in

manufacturing and how IPR systems might be built to facilitate this. Competition supporters usually argue for a fair and equal environment where the best idea wins. In environmental policy, this means steering the winning solution toward sustainable production. Since they are pioneers and put pressure on existing enterprises, start-up companies are often cited as possible catalysts for creative sustainability solutions. Start-ups can force automakers to build greener automobiles. Start-ups have limited resources, technology infrastructure, market capabilities, and intellectual property rights. It is hardly incorrect to state that larger companies are better at sustainable manufacturing. The increasing urgency to address the global climate change catastrophe necessitates a focus on expediting the transition process. Consequently, a crucial inquiry arises for finding the most effective approach to foster collaboration between new entrants and established entities. The objective of the same is to eliminate unsustainable industrial processes and replace them with more environmentally friendly alternatives. Significant areas of inquiry encompass novel procedures and regulatory measures aimed at expediting the early transfer of intellectual property to enhance the uptake of sustainable technologies among competitors. This, in turn, accelerates the pace of cumulative technological advancements. Further investigation is necessary to determine the most effective approach for promoting a greater inclination among rivals, both established and emerging, to engage in sharing activities, such as licensing. This is crucial for enhancing the dissemination of sustainable products and technology.

The inclination to engage in collaboration, knowledge sharing, and licensing is also evident in the discourse surrounding cross-industry innovation and the concept of the circular economy. The act of sharing information and resources within the industry, both among competitors and across the value chain, as well as extending to cross-industry collaborations, can be facilitated through various means. One such approach involves advocating for the adoption of voluntary or non-voluntary licensing arrangements that ensure fair and reasonable terms. Additionally, the inclusion of grant back clauses, which provide incentives for innovators to share their improvements with competitors, can further encourage sharing within the industry.

The current study on sustainable manufacturing shows that cross-industry approaches benefit several industries. These breakthroughs face more challenges and cost more than intra-industry developments in specialized domains. Concerns arise from industry-specific terminology and behaviors. The investigation focuses on reducing transaction costs for cross-industry and cross-country collaboration and intellectual property transfer. Experimental action research in firms can help control intellectual property commons, including rights. This might enhance sustainable manufacturing and poverty reduction. Automation, textile, chemical, consumer products, and other companies use licensing and other methods to share sustainable technological knowledge. Instead of merely examining tangible assets like cars and bikes, the sharing economy research should include intangible assets, intra- and inter-sectoral sharing as thesame may help governments make judgments and management suggestions and build infrastructure to promote sustainable manufacturing.

The Circular Economy research emphasizes the need to efficiently manage IP transfers at CE system interfaces, especially for new entrants who are indulge in loop closing. Researching IP issues in circular economy applications is vital and designing regulations to use IP systems to support CE procedures is also urgent.

The aforementioned factors and ongoing discussions on the impact of intellectual property rights on sustainability transitions in the manufacturing industry highlight the continued necessity for more comprehensive study aimed at gaining a deeper understanding of the implications of IPR systems. Further research is necessary to enhance our understanding of the influence of intellectual property rights, such as patents, trademarks, industrial designs, and trade secrets, on the advancement, use, acceptance, and dissemination of sustainable technologies. While acknowledging the challenges in implementation, it is imperative for research endeavours to extend beyond the scope of individual country studies and encompass transnational value chains. This broader approach is necessary to thoroughly investigate the influence of intellectual property rights on sustainable innovation and dissemination processes.

Need to Reinterpret ‘Property in Goods’ in the Realm of Private Law

For resolution of ambiguity regarding the ownership of IP and confusion between ‘repair’ and ‘replication’needs reinterpretation of the concept of property in goods/technology.

Environmental law regulates both state-individual/ organization relations and individual/organization

interactions, although it concentrates on public law. This method distinguishes private from public law so as to argue that traditional private law systems may strengthen the legal framework's circular economy promotion.

Utility theory is the primary IP rights theory since it validates physical and intangible property ownership. IPR incentives encourage inventors and entrepreneurs to produce novel technology. The public would profit less. However, social planning theory suggests that property and intellectual property rights can promote fairness and virtue. Like utilitarianism, this approach is teleological but seeks to employ comprehensive good concepts beyond utility maximization. Utility-based concepts dominate European and Western intellectual property laws. These concepts support private property rights using economic and motivational theory. This strategy reduces information and transaction costs and collective action issues, enhancing individual liberty.[32] This owner-centric approach views each owner as a "gate-keeper" with rights that bind all parties, including third parties. This technique may give rise to sustainability and circular economy issues since it must prioritize resource optimization above owner economic expectations and interests. In contrast, private property is based on morality since people have freedom and a social obligation to others. If one chooses any of these 'just society' interpretations, private property can be imagined in light of social planning theories.

Understanding the property law regime, and in particular the act of leasing, which gives a relevant example, is necessary for comprehending the rights of the parties in licensing of IPR and its drawbacks. Product-service systems (PSS)[33] are used to illustrate these points since they are an example of an engaging business model in the setting of the CE.[34] However, this study is not concerned with every possible combination of material goods and immaterial services. The provision of useful services is our primary concern.

Please note that this article only covers some intangible commodities and services and their combinations. The research focuses on use-oriented services. In use-oriented services, “the traditional product still plays a central role” and “the product stays in ownership with the provider, and is made available in a different form, and sometimes shared by other users.”[35] The customer does not own the goods in this scenario and has limited proprietary rights. Product leasing, including PSS, has environmental advantages, hence these two economic models—Circular Economy and PSS—are linked. It is feasible to fulfill a given demand with fewer items, and profit and output volume do not follow the usual linear model. PSS thus encourages producers to make durable goods. PSS have the ability to create a more eco-friendly and efficient economic system.[36] The downsides to this, which should not be ignored, are that PSS is typically legal in nations which have a sparse lease regulations since it is consistent with the principle of contract freedom.

Customers' decisions may be influenced by a number of circumstances, but reasonable customers will take into account the difference in legal standing between a lessee and an owner. For example, a customer (a lessee) cannot transfer ownership over to someone else, but the buyer can. The categorization of the lessee's right might be as either an obligatory right or a non-proprietary right, which does not have the same level of protection as ownership, a right in rem.[37] The justification for limiting the right to use in various countries has predominantly relied on utilitarian theories on the concept of property, while mainly disregarding sustainability issues. In many countries, the traditional view is that the best way to distribute resources in a market-based economy is to make sure that the new owners have the very few restrictions on their ownership rights.[38] Two primary approaches have been employed to address the dispute thus far: 1) the lessee's right is considered an obligatory right that does not impact the new owner in any way, or 2) the lessee's right is safeguarded, although to some degree. The conventional approach, which has been implemented in several legal systems, is model 1). However, certain nations have also embraced a variant of model 2). In regards to the property pillar, there exist some aspects of property law that might impede or hinder the adoption of circular economy business models, such as PSS. An illustrative example is the preference given to property ownership over other arrangements like leasing, which may be perceived as a more favourable right. The research in this article asserts that prioritizing sustainability as a fundamental concept necessitates the development of novel legal procedures and regulations.[39]

The Gap in IP Licensing Process

Within the existing framework of functionality and incentive-based models governing IP, public welfare

including environmental sustainability, are frequently overlooked or marginalized in favour of private commercial interests. In the determination of the scope of protection, societal values beyond economic efficiency are typically seen as incidental rather than explicitly considered.

As an illustration, while considering the domain of patent law, it becomes evident that behaviours that may diverge from the objectives of the CE encompass activities associated with the ability to commercially repair IP protected assets. Within the realm of global patent laws, the doctrine of exhaustion pertains to the notion that once a patented article is lawfully introduced into the market with the explicit consent of the patent holder, said holder relinquishes any viable entitlement to exercise control over the subsequent resale, importation, or utilization of said physical article within the domestic market.[40] While the exhaustion concept applies to loans and the repair of protected property, it should be noted that the repair activities, namely those considered as 'routine' repairs and maintenance, are permissible only if they do not amount to the act of 'creating' the invention. Nevertheless, the differentiation between (illegitimate) "making" and (legitimate) "ordinary" repairing is not a straightforward matter. While reproducing copies of a patented invention without authorization is considered an infringement, the permissibility and extent of modifying or repairing a purchased patented item remains unclear. The determination of whether the act of changing pieces of a protecteditem constitutes 'ordinary' repair is sometimes a matter that needs individualized examination and analysis.[41]

The principle of exhaustion stipulates that a buyer ought to have the right to utilize a product according to its designated purpose. Consequently, it should be permissible to carry out repairs that fall within the customary lifespan of items. On the other hand, the average length of a product's life is often judged by social standards, which may not always be based on sustainability. Also, the way patent makers do things, like how they create a product, could affect how long it lasts, since a shorter product life cycle tends to be more cost effective.[42] Possible relevance of the notion of planned product obsolescence, in which a product is developed or designed with a purposely limited lifespan, resulting to its obsolescence (i.e., becoming old or non-functional) within a set time frame.

Insufficient congruence between IP frameworks and sustainability goes beyond patent law's regular repair obligations. While certain national and international patent policy initiatives support environmentally friendly technology breakthroughs, the focus is largely on'soft' policy measures. Separate patent classes for climate change mitigation ideas and speedier processing for 'green' patent applications are examples.[43] More importantly, patent law does not reference environmental sustainability in legislative provisions or interpretations. We shouldn't assume intellectual property rights are an incentive for innovators. A lot of research doubts the efficacy of intellectual property rights incentives, arguing that ingenuity can thrive in many industries without them.[44]

Concrete Solutions

Western legal systems promote property owners' financial and psychological security. Intellectual property is included. Public law systems are necessary yet flawed. Without compatibility between public and private law objectives, private law systems may undercut public law endeavours. The potential for IPR-protected items to impede the new domestic legislations which stimulate the right to repair for household appliances becomes obvious. These instances suggest that few aspects of private law, such as the property pillar, may need to be rethought to successfully include CE and sustainability into global legal systems. If policymakers used a socially-oriented planning approach to property kinds instead of a utility-based one, this may happen. This objective can be achieved by passing laws that balance protection and access while protecting ecological integrity.[45]

Many opportunities exist to apply social planning principles to property law, such as;

a) The common view of the lessee's right as an automatic entitlement may be challenged. This might pave the way for the dissemination of important circular economy business models like PSS focused on customer needs. The idea of long-term viability can be used to justify the grant of an all-encompassing proprietary right that goes beyond the scope of a standard leasing related proprietary right, especially with respect to the exclusion of third parties.[46]

b) From an IP law perspective, particularly in the domain of patent law,a significant obstacle to promoting circular economy is the determination of the permissibility and extent of repairing protected objects without infringing upon the protected

innovation. One potential approach to addressing the issue may involve the incorporation of a specific provision inside IPR frameworks. This provision would permit the repair and reuse of protected objects, even for commercial reasons, either as a general rule or subject to clearly stated limitations.

c) To confront the basic question of how we understand the normal lifespan of protected assets when deciding the presence of a breach is a more ambitious choice. Potentially, including environmental considerations in the deliberations of domestic courts could be one way to shift the focus of intellectual property from a purely utilitarian perspective to a more socially-oriented one, which aligns with significant values such as environmental sustainability. To do this, environmental reasons might be incorporated into the calculation of elements like the "typical" lifespan of protected property at issue in infringement proceedings. The transition would improve the IP system's ability to foster the development of a culture that is seen and understood as equitable and appealing, congruent with a more holistic view of social development, and is therefore essential in a society where environmental preservation is seen as a core principle. This shift in thinking has the potential to increase social, environmental, and economic justice, creating an atmosphere where stronger products may be manufactured and broken ones can be repaired.[47]

d) More generally, a number of other steps should be considered if we want the property framework in IPR to more accurately represent the social-planning sorts of behaviour that would support the CE. Included among these are possible revisions to patent and trade-mark law that would prohibit the protection of inventions or signs that are deemed to be unsustainable on grounds of ordre public, public policy, or morality.

Informal Apropriability Mechanisms to Deal with IP Leakage, Spillover and Ineffective IP Management in Collaborative R&D Projects

Processes for formal apropriability are codified in law and based on IP rights and contractual commitments. Companies are given limited commercialization rights to research results, product designs, and novel invention.[48] As a method of encouraging businesses to invest in R&D efforts with the hope of producing important discoveries that may later be preserved by legal protection, formal appropriability processes should be implemented.[49] Patents, copyright protection, legal agreements, and document management are just a few examples of the many legal and contractual measures that fall under the umbrella of "formal appropriation methods."[19] Legal rights and contracts awarded to companies are referred to as "formal appropriability methods"[50] and can be used in the event of a lawsuit or intellectual property infringement. Techniques like keeping information under wraps, giving yourself plenty of time to steal it, and layering on intricacy are all examples of informal appropriability approaches. Having access to secret, often unspoken, knowledge is crucial to the speed and sophistication of a company's products or procedures. With this information, organizations may benefit from complex developments that other companies would have a hard time duplicating in a reasonable amount of time.

Preparation Phase

The preparatory phase during collaborative ideation has a crucial role in improving the efficacy of safeguarding measures. During the preparatory phase, organizations conscientiously establish research and development (R&D) objectives and strategies for appropriability processes before engaging in joint ideation projects. At this juncture, organizations make determinations on the feasibility, need, or impediments to engaging in joint endeavours for a certain project, as well as the appropriate appropriability method to employ. During the planning stage of the preparation phase, organizations aim to optimize the efficacy of safeguarding measures by assessing the necessary conditions for secure collaborative ideation. The establishment of a joint legal agreement is advantageous in facilitating the provision of adequate protection[51] as it prevents the unauthorized use or disclosure of confidential information.

The process of drafting legal agreements among several parties necessitates a significant investment of time in order to ascertain pertinent facts such as for the contractual arrangement. The challenge is in formulating contracts that rely on imprecise notions in order to mitigate uncertainties and effectively provide safeguarding measures. It is important to initiate dialogue with legal departments of different firms in a timely manner to proactively mitigate any delays in the joint ideation process. Legal agreements are frequently established using several contract templates such as non-disclosure agreements (NDAs), memoranda of mutual understanding (MoUs), and joint development agreements (JDAs).

Legal agreements during the preparatory phase have the potential to enhance the efficacy of protection measures by deterring the unauthorized appropriation of information, elucidating relevant details, and establishing explicit guidelines for the utilization and limitations of this information.

Operation Phase

In the operational phase, manufacturers employ idea creation methodologies, such as design thinking, to facilitate the generation of prospective possibilities within collaborative environments. The operation phase facilitates the application of diverse viewpoints inside organizations, as it encourages partners to focus their attention on pertinent issues, therefore contributing to the development of valuable solutions.

In the realm of corporate operations, intrafirm secrecy serves as a secondary technique employed by corporations to impose limitations on the utilization of information by individuals involved in internal projects. The concept of intrafirm secrecy pertains to the manner in which organizations develop their operational procedures while taking into account the need to maintain privacy for their personnel. The senior leadership group enforces policies and procedures that involve limiting access to information pertaining to collaborative ideation.

Using codenames for labelling projects, implementation of security systems for the purpose of limiting access to important documents, controlling and limiting the entry of non-related project members to dedicated facilities (i.e. laboratories and tests chambers) is a useful method for reducing the likelihood of intentional knowledge spillovers.

In collaborative projects, document management entails taking actual steps to limit who has access to and how they might be used. Many methods are used by companies to efficiently manage joint concept papers such as labelling as secret any documents that are shared among the project's members that contain sensitive data.

One of the key findings derived from the main data is the incorporation of intellectual property within the framework of project management. It is recommended that organizations include intellectual property considerations into their project management framework in a formal manner for the evaluation and oversight of newly generated intellectual property.

Finally, recording of meeting minutes let organizations formalize all information as part of their document management procedures. Working together to generate ideas usually leads to more fluid collaboration. Knowledge sharing helps communities solve problems. The project team must record the key take aways from each phase in meeting minutes. Meeting minutes improve protection by documenting possible joint ownership.

Termination Phase

The final process, known as "termination," plays a crucial role in boosting the protection further.The termination phase is a designated period whereby the benefits of collaborative ideation are realized through the utilization of the resulting findings in subsequent scientific endeavours or commercial ventures. The phase aligns with the conclusions drawn from the study conducted which substantiated the significance of appropriately concluding collaborative ventures. There are two categories which emerge from the primary data i.e. co-patent application and interfirm secrecy.

A "co-patent application" is the initial submission to a patent office by interfirm IP owners seeking a patent for a claimed innovation. Partners can safely divulge their expertise and create shared ownership of jointly generated knowledge by co-patenting an innovation. This can enable out-licensing, joint ventures, and spin-offs. Patent co-ownership is a key strategy for company-academic partnership. The persons apply for a co-patent that is not yet specified, but it serves as a framework for talks with the partner and protecting the uniqueness following brainstorming. Additionally, a co-patent can serve as a legal mechanism to substantiate joint ownership and mitigate any conflicts. Co-patents provide as legal documentation of co-ownership, so mitigating any conflicts in the future.

Interfirm secrecy is the last termination phase and refers to using internal rules to control the dissemination of unique intellectual property information across brainstorming partners. Secrets sometimes impede organizational understanding. Partners sometimes exchange freshly generated intellectual property privately. Thus, the parties set deadlines and terms for incorporating the newly acquired IP into their products and promise to keep it private from unrelated parties, notably competitors. There are two main reasons for interfirm confidentiality. First, it deters patent trolls from copying proprietary ideas. Second, it protects against ephemeral and confusing methods for sharing or protecting new intellectual property.

In certain instances, there may be transitory and indeterminate solutions for the sharing or safeguarding of novel intellectual property that may arise after the conclusion of collaborative brainstorming. The practice of collaborative brainstorming is frequently carried out within limited time frames, thereby impeding the subsequent advancement of robust patents. In this particular scenario, it is imperative to maintain confidentiality about the newly formed joint intellectual property for a brief duration, until the subsequent actions and strategies have been clearly delineated.

Conclusion

The Global West, especially Europe's press for green economy through CBAM (and circular economy being one of its apparatus) will have an overwhelming effect on the current manufacturing hubs of the world. These measures although, at the outset, aim to achieve carbon neutrality but behind the veil seem like a market protectionism policy. The affected states will challenge such measures at WTO on two grounds; first, these measures will have extra-territorial affect and this issue hasn't yet been settled by WTO. Second, they are not covered under Article XX of GATT (general exceptions) as they do not fulfil the criteria of chapeau i.e. "arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade". It will be interesting to watch how these disputes unfurl as the history of dispute resolution process under both, GATT and WTO, has favoured trading objectives over the environment. In addition to it, the suggestions made by the author regarding making an exception to IP regime will also require an amendment or an exception being carved out in the TRIPS with due process, which will take majority vote of the member nations. Apart from these public laws, there is a need of significant overhaul in international and domestic private law regimes to have circular economy plan to be up and running in the light of current IP law created obstacles. Tough times ahead of us i.e. private entities and the sovereign bodies to navigate through the battle between trade and environment.

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