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Article

DIFFERENTIAL PATENT TERMS AND THE COMMERCIAL CAPACITY OF INNOVATION

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***374** "There is nothing magical about the length of a seventeen-or twenty-year term. Congress clearly has the power to

change the term to any limited period of time, and alternatively could structure the patent term so that different types of patented subject matter had different patent lengths."[aa1]

During the past four decades much has been written, both in legal and economic literature, about the elements that should determine the scope of patent protection. While one segment of that research advances the view that patent rights (the patent breadth), in and of themselves are sufficient for attaining the optimal degree of socially-desirable patent protection, the other segment contends that the patent term (length) needs to be factored in. My research taps into this debate and emphasizes the need to discontinue the use of a single patent term for all types of patents. Specifically, I propose using a differential patent term, in which duration is contingent on the type of innovation and its underlying technology. Here, I resort to, among other things, the Strasbourg Agreement Concerning the International Patent Classification, a system of classification that can contribute towards applying the patent length factor in an efficient and relatively cheap manner.

I. Introduction: The Patent's Length-Breadth Dichotomy

While the quest for bolstering innovation lies at the heart of patent law, the content of that innovation and how it needs to be protected is not wholly defined. This is largely due to the fact that the patent system affects not only the patent holder but also consumers and other prospective innovators who seek to incorporate existing patented technology into their respective inventions. Each of those three interest groups articulates a distinct case for (or against) strict patent protection and presents a self-motivated perspective as to how and to what extent innovation should be protected. Thus, any attempt to optimize the scope of patent protection would need to involve a continuous balancing act between those three interest ***375** groups. Such a balancing act would typically involve adjusting the scope of patent rights and offsetting their impact by applying limitations (exceptions) prescribed by conventional patent law. An additional although less obvious factor that can be invoked in this context relates to the actual duration of the patent term.

In effect, this research is set against the backdrop of a decades-old debate in legal and economic literature, relating to the elements that should determine the extent of patent protection. Specifically, this debate relates to the length-breadth dichotomy, a central feature of patent discourse.[1]

Traditionally, the scope of the patent right, or what is also referred to as the patent breadth, has been deemed to be the sole balancing element within the patent protection mechanism. This approach views the patent breadth as a "better instrument than length to encourage socially optimal timing."[2] It has been downplayed by Gilbert and Shapiro, suggesting that the patent term should be the main focus of patent protection.[3] In their view, infinite but very narrow patents would allow investors to recoup their respective research and development expenditures, which, in turn would minimize dead-weight losses.[4] But in between these two polar approaches rests the intermediate position focusing on the "effective" patent life.[5] Here, both breadth and length can be utilized.[6]

My research comprises two layers: a "surface" and a "core." First, at the surface, I offer reasons as to why the patent breadth lacks the sufficient degree of flexibility to optimize patent protection. Following this, at the core of this research, I take stock of what economists teach us about their quest to achieve the optimal ***376** degree of protection. I also highlight the arbitrary nature and legal history of the twenty-year patent term and demonstrate why, both conceptually and practically, patent length should be formulated in a more flexible manner. Following all of this, I present my case for a new model that incorporates the patent length. To this end, I formulate a sophisticated yet workable model that is intended to navigate the Trade-Related Aspects of Intellectual Property Rights Agreement (TRIPS)-induced conventional patent régime closer to this optimum. In effect, my proposed model challenges the conventional wisdom relating to the patent term and proposes a workable tool that factors in the patent length element. I achieve this by building on an existing tool of classification, namely the Strasbourg Agreement Concerning the International Patent Classification.

II. The Surface: Insufficiency of the Patent Breadth in Attaining Optimal Patent Protection

Before tackling the core of this research--the method to create a patent term that is technology-dependent--one would need to challenge the sufficiency of the conventional patent term. Specifically, the question here would be whether the patent breadth constitutes a sufficient tool for singlehandedly achieving a social equilibrium, which I refer to as Optimal Patent Protection (OPP). The OPP is attained at a point wherein the level of patent protection still provides ample incentive for continued research and development (R&D) by the patentee while not excluding innovative newcomers or hampering consumers'

access to innovation. In this regard, Abrams provides a clear definition of the optimal patent term: "[the] point at which the marginal benefit from increased innovation is exactly offset by the marginal cost of the deadweight loss created by the patent right."[7]

The argument for the sufficiency of the patent breadth states that patent law is in fact not uniform in application but only in concept, and that although patent law is "technology-neutral in theory, it is technology-specific in application."[8] In accordance with this view, the optimal balance within the patent system can be achieved using tools that already exist within the patent breadth and which form an integral part of patent law. Merges and Nelson suggest that the scope of patent rights--the patent breadth--is the better tool vis-à-vis duration for creating reform ***377** because it is under the courts' control.[9] In other words, the patent breadth rules (and exceptions) allow the courts to apply their judicial discretion and interpret the rules as they deem fit.[10]

If one were to accept this view (i.e., that the patent breadth would suffice), then one would be tempted to discard the patent length while relying on existing legal tools in the form of "policy levers" that are deemed to be sufficiently responsive to the needs of specific industries.[11] Conversely, if this argument is refuted, as I argue it should be, then the patent length would need to be added into the mix.

A. Conventional Tools of the Patent Breadth

Granted, there are legal tools that provide some room for maneuverability within the existing patent system and can potentially edge that system closer towards optimal patent protection.[12] Those tools include compulsory licensing, experimental use, and inventing around the patent, as well as humanitarian-motivated notions of social responsibility. This section is devoted to illuminating those tools, assessing them, and ultimately rebutting their alleged sufficiency.

***378** 1. Compulsory Licensing

The compulsory licensing mechanism imposes on the patent holder an obligation to license the use of his patent to others in those cases in which he does not use his patent or uses it too narrowly. This mechanism is now recognized by the TRIPS agreement.[13] On the macro level, compulsory licensing can help developing countries maximize access to essential medicines while minimizing undesirable side effects that might occur otherwise, such as costly expenditures or foreign aid, to which a political price tag is usually attached.[14] It also provides a way for combating patent trolls.[15] As such, the compulsory licensing mechanism is deemed to play a "positive role" by way of easing the "static inefficiency" that is associated with high-cost firms being granted licenses.[16] When faced with the prospect of invoking a compulsory license, the relevant patent holder is inclined to react in a "welfare-enhancing way" by lowering the output price that is intended to create a disincentive for other market players who may be contemplating applying for a compulsory license.[17] As such, this tool has been deemed to contribute to optimizing patent protection.[18]

Notwithstanding the importance of compulsory licensing, however, its application has been narrowly construed. Specifically, its application has been most ***379** prevalent in the ongoing debate relating to access to patented medicines.[19] Furthermore, the compulsory licensing tool is most relevant when a patent is not being utilized by its owner.[20] As such, this tool is much less useful when a patent is actually being used by its holder, as it is in the majority of cases.[21] Thus, the scope of this important tool is limited and is insufficient to offset the legally induced power harnessed in the patent breadth. It is worth noting that the linkage between the compulsory license tool and the flow of technology from the patent holder to market competitors has not been established and remains in contention.[22] Moreover, the impact of compulsory licenses on innovation is further restrained by the threat of withholding foreign direct investment (FDI) to the granting nation. Research has demonstrated how FDI-related threats adversely influence developing countries' strategies pertaining to the granting of compulsory licenses.[23] As such, the compulsory licensing mechanism, notwithstanding its expansive adoption within TRIPS-compliant patent laws, cannot ensure the effective diffusion of technology.[24]

***380** In light of those constraints, the compulsory licensing tool appears to have remained a "welfare" exception in conventional patent law and not one that can facilitate access to innovation by competitors or consumers.[25] For this mechanism to be effective, it needs to be part of a larger scheme and be coupled with "external social and political conditions."[26] But in its present form, the compulsory licensing tool cannot itself secure the optimal level of patent protection.[27]

2. Experimental Use

The second mechanism that needs to be assessed is referred to as the experimental use exception. This exception allows for the use of patented information to facilitate pure research without fear of ensuing patent infringement claims.[28] Typically, this exception covers limited cases such as building experimental machines or using test data that has been submitted to national administrative bodies such as the Federal Drug Administration (FDA) in the United States.[29] Indeed, for a quarter of a century now, United States law has recognized the experimental use exception.[30] It is worth noting that in the U.S., 35 U.S.C. § 271(e) (also known as the "safe harbor" clause), which sanctions experimental use, has been interpreted increasingly ***381** broadly.[31] This is deemed to have been "most favorable to parties who were utilizing the patented discoveries of others to perform research directed towards attaining approval by the Food and Drug Administration for pharmaceutical products prior to the expiry of the patents."[32] Notwithstanding its attributes, this exception is hindered by two hurdles. First, its application is limited to a narrow segment of technology, and second, it entails a social cost in that it creates a disincentive to the parties that "expended time and resources to perform the initial development work to obtain these patents."[33] In this regard, Jahn warns that this state of affairs may ultimately prompt innovators to relocate their research activities beyond the relevant jurisdiction--where there may be more favorable rules that protect their innovation and test data.[34]

3. Inventing Around the Patent

Generally, it is possible to identify two cases that can bring about the effective termination of a patent.[35] The first and obvious case involves the actual expiry of the patent term.[36] The other case involves the introduction of another (non-infringing) patent that effectively neutralizes the commercial value of the first patent. ***382** [37] While in the first case the end of the patent term is deemed to be inevitable, in the second case another market competitor will attempt to reduce the original scope of the patent breadth to gain a foothold in the market and curb the market control granted to the holder of the original patent.[38] The latter tactic is referred to as "inventing around the patent."[39] This tactic builds on the fact that the patent application and claims therein leave ample room for attaining the "technological benefits of the patent without duplicating the particular steps constituting it and thus without infringement."[40] This is possible because disclosure of the steps that lead to re-creating the invention are sufficiently detailed to enable those knowledgeable in the relevant technology to produce a product that is similar to those covered by the patent while circumventing the patent claims of the original patentee.[41]

This exception, however, is not likely to sufficiently facilitate the proliferation of knowledge or innovation or attain optimal patent protection. An innovator concerned about the prospect of someone else inventing around his patent might opt for the legal protection provided through trade secrecy mechanisms, in which case no disclosure is required.[42] Such conduct, however, is likely to come at the detriment of society because it detracts from the benefits of the patent system, which encourages full disclosure of an invention in return for a right of sole use for a limited time.[43] Furthermore, because of the potential of inventing around the patent, ***383** over time, patent attorneys have become much more conscious about drafting patent claims that are exceedingly difficult to sidestep.[44] In fact, this state of affairs is likely to induce patentees to simultaneously engage in barricading their invention by employing numerous tactics, such as filing numerous patents and drafting patents with very broad claims. In that case, the innovator would be expending far too many resources on securing patent protection, thus raising the overall cost of the relevant technology. Consequently, prospective competitors are expected to encounter greater difficulty and to invest increasing resources in their endeavor to invent around existing patents. They are also at greater risk of facing patent infringement lawsuits that will probably entail the imposition of sanctions against them. Additional constraints also apply on the macro level, wherein the inventing around process may adversely impact FDIs.[45] Lastly, it is important to bear in mind that in some cases the original patentee is entitled to legal protection regardless of the way the new product has been reached.[46] Evidently, the nature of protection in those cases neutralizes the possibility of invoking the "inventing around" tool.[47]

The aggregate effect of all of these ultimately nullifies the significance of this mechanism. Thus, in light of the risks and potential costs associated with this tactic, its contribution towards the optimization of patent protection is highly doubtful, or, at best, negligible.

4. Humanitarian-Motivated Social Obligations

In addition to the above-mentioned tools, it is possible to identify another one that, although not part of formal patent legislation, is applied in response to pressing ***384** social needs or humanitarian concerns. This exception is based on the view that property rights are not absolute in that they can (and should be) offset by other social interests and on the conviction that there is a need to incorporate social responsibility into the concept of property--in other words, that property

entails social responsibility.[48] By applying this concept to the patent context, one could argue that patent protection cannot be focused only on an innovator's patent rights and that other social interests need to be considered. Indeed, this exclusion pits the need to maintain innovation against the "here and now" needs of the collective. This clash is especially relevant to the debate regarding access to patented medicines. In that debate, various attempts have been made to counteract the impact of patent rights by invoking concepts of social obligation and compassion.[49] In line with this concept of property, various attempts have been made to facilitate the entry of generic versions of pharmaceutical products into the market.[50] In the United States, the Drug Price Competition and Patent Term Restoration Act of 1984, informally known as the Hatch-Waxman Act, has lowered the barrier to entry for generic drug firms.[51] It established a process by which prospective marketers of generic drugs can file Abbreviated New Drug Applications (ANDAs) for the purpose of attaining FDA approval for the generic version of the patented active ingredient.[52] In effect, ***385** the Act creates a 180-day exclusivity period to companies that are the first-to-file an ANDA against holders of patents.[53] But, given its focus, this exception has a limited coverage as well.

B. Conclusions about the Patent Breadth

From all of the above, it appears that the existing tools that patent law provides do, in fact, reflect an unequivocal unease with the conventional patent system. These exceptions seem to have been formulated with the intent to vent some of the pressures that transpire from the conventional patent system. Indeed, these tools profess the recognition that the strength of patent protection has led to an overreaching effect of the patent system and indirectly created a disincentive to innovate. In this regard, Gallini warns that "[i]n an environment of cumulative innovation, patents can undermine protection on the very inventions they seek to protect."[54] This environment is manifested in various forms, namely a diminished motivation to engage in research activity; overinvestment in substitute inventions; reduced incentives to develop improvements; and the shift from basic research to applied research.[55] Ironically, then, the same system that has been created to promote innovation has become a hurdle to attaining it. That is why it appears that, by applying these exceptions, the regulators have not remained completely indifferent to the potentially adverse impact of stringent patent protection on competition and on society as a whole.

The exceptions surveyed constitute an attempt to recalibrate the conventional patent system to optimize the benefits that it generates for all parties concerned. Using these exceptions, regulators have attempted to maintain a balance between the competing interests within the patent (innovation) domain. Yet, as I have demonstrated, each of these measures falls short of attaining this balance. Furthermore, the aggregate effect of these exceptions also fails to meet the minimum threshold needed to optimize the level of patent protection and innovation. These exceptions are not sufficiently responsive to social needs; they appear to perceive the patent system from a purely economic perspective. In addition, they are case-sensitive ***386** and narrow in that they do not apply to all patentable subject matter. What's more, these exceptions do not apply to all patents as part of the law, but are contingent on specific circumstances and courts' discretion. Notably, all of these exceptions relate to the breadth (scope) of the patent right rather than to the length of the patent term. Indeed, these exceptions effectively overlook the patent length and ignore its untapped potential as a tool for balancing between pure patent (property) rights and other social interests. This deficiency arguably stems from a misconception that patent protection constitutes a zero-sum game in which either the patent holder or his competitors will prevail. To my mind, given the legitimate interests of all those concerned, such an approach is highly problematic because all of the stakeholders--who are involved in the patent game--possess valid interests that need to be considered. Optimal patent protection is the aggregate vector of all of the interests that are involved. Thus, despite their undeniable contribution, these tools have a limited caliber and cannot by themselves achieve the fine-tuning required in moving towards attaining the optimal degree of patent protection. As such, those tools cannot substitute the role of the patent length when seeking to optimize patent protection.

If the patent system is to reach an optimum, it simply cannot continue to ignore the interests of one party for the benefit of another. Indeed, the issue here goes to the core of patents as a type of social construct. While on their face patent rights are viewed as a deliberate attempt to create a monopoly for the benefit of the innovator, there are those who question the merits of this type of "exclusionary" property.[56] In this regard, Son warns against unrestrained patent rights that might transcend the legitimate exploitation of the legally acquired monopoly.[57] To create a balance between the patent holder and his customers, Son advocates limiting the patent rights based on rationales relating to the public interest.[58] Dagan views property as an institution that manifests many "inclusive" traits.[59] In his view, ***387** "[p]roperty turns out to be about both exclusion and inclusion."[60] Furthermore, he observes that "[i]n their different domains, the right to exclude and the right to entry can peacefully cohabit under the heterogeneous, though not formless, umbrella of property."[61] By similar measure, patent law cannot and should not be viewed from the narrow context of exclusion.[62] Inclusion of social interests should be an integral part of patent protection. The scope of patent protection should be determined based on the overall inclusionary goals for

which purpose the patent concept was originally conceived.

Henry has attempted to alleviate the unease generated by the strength that is granted to innovators by proposing a "runner up" patent mechanism.[63] In this proposed mechanism, a subsequent inventor is allowed to share in the original patent if he files for a patent on his related discovery or invention within a predetermined period after the first patent.[64] Although Henry appears to be well aware of the potential reduction in research-related incentives, he is adamant that such losses will be offset by the social benefits his proposed model provides.[65] The value of Henry's proposal in the context of my research lies in his view that the patent breadth cannot function alone and that monopoly rights created by patent law cannot block out other socially desirable interests.[66] Indeed, given the nature of the interests involved in patent discourse, patent law should not fixate on the private domain and overlook the other interests that pertain to it, namely, those in the public domain. But in my view the picture is even more complex. Indeed, the public domain relates to two competing subgroups, namely, other prospective innovators and society at large. While the first group seeks to base its own inventions on existing patented technology, the second group seeks to use that technology while enduring a minimal burden of rent (royalties or license fees). Thus, the scope of the patent grant needs to achieve a balance between various competing, socially-desirable interests. This is not an easy task because while the residents of the public domain ***388** are likely to push for an exceedingly lenient patent system, the private-domain entities would most likely threaten to halt all innovation if the rent and control factors are not adequately secured or are structured to their detriment.

In this context, Gallini is rather skeptical of the conventional patent system's ability to achieve the balance between patent protection and other interests. This skepticism is well demonstrated by her observation that "we can no longer rely on the simple tradeoff--that patents stimulate innovative activity."[67] She predicts that "[a]s new technologies emerge, so will patent, legal and antitrust rules that govern the granting, enforcement and exercise of intellectual property protection."[68]

This section highlighted the inherent faults within the conventional patent system--particularly the weakness of the patent breadth. Given that the patent breadth is unable to secure these inclusionary elements, it appears there is a need to resort to the other element in patent protection--the patent term. Consequently, the core of this research is intended to create a mechanism, the task of which is to compensate for the weakness of the patent breadth. Thus, my proposed mechanism involves a more versatile patent system vis-à-vis the patent term that is granted to patentees.

III. The Core: Shifting to a System of Differential Patent Terms

Because the tools within the parameters of the patent breadth fall short of singlehandedly attaining optimal patent protection, it becomes clear that the patent length can no longer be sidelined or sidestepped. Thus, the challenge in this context centers on devising a patent length rule that would be helpful and feasible to implement.

A. Misgivings of the Conventional Twenty-Year Patent Term

Until now, the patent term has largely been applied in a unitary manner. Specifically, the rule of thumb has been a twenty-year patent term for all types of patents.[69] Thus, before embarking on any ambitious project involving the adoption of a differential patent term, the first order of business would be to assess the generally accepted twenty-year patent term and see whether it holds up in view of the ***389** well-established rationales underlying the patent system. This paper establishes that it does not.

1. Origins of the Twenty-Year Patent Term

The legal history of patent law suggests that the first rule prescribing a formal patent limited in time can be traced back to the Republic of Florence in 1421, when patent terms were set at ten years.[70] In 1624, English law prescribed a fourteen-year patent term.[71] Research indicates that both of these terms existed absent a defined vision as to the proper length of the patent term.[72] Interestingly, in pre-colonial America, the patent term was set in some territories in accordance with the value of the innovator's contribution.[73] Accordingly, the patent term fluctuated from as short as seven years to a duration equivalent to the life of the inventor.[74] In time, the U.S. Congress adopted a fourteen-year term in the first Patent Act, in 1790.[75] In 1861, the patent term was set in the United States at seventeen years, and in 1994 the patent term was extended to twenty years.[76]

Nothing in research provides a convincing account of why such a "limited time" of twenty years is better than an

eighteen-year patent term or more justified than a twenty-two-year patent term. On the contrary, the legal history of the twenty-year patent term shows that it is more a result of an arbitrary rule than a calculated ***390** term that is founded on solid rationales.[77] Partnoy observes that "the patent term has not evolved in response to changes in any discernable set of variables, or even in any evident pattern."[78] Consequently, Partnoy considers the conventional patent term to be "more historical accident than efficient evolution."[79]

Even more so, the twenty-year patent term has become standard practice in the overwhelming majority of patent laws around the world--not because of a deep conviction on the part of legislators as to its merits, but rather because of the influence of the TRIPS agreement, which prescribes a minimal (and extendable) patent term of twenty years.[80] Furthermore, because the patent term is an imported norm, it may also be possible to argue that extending the patent term would result in the imposition of net costs on the national economy and especially on consumers therein.[81] This would be a further testament to the effects of the "global" influence on the "local" industry in the intellectual property context.[82] Indeed, the patent system has been the subject of much debate as to its benefits (or lack thereof) for developing countries.[83] Despite the significance of this in the context of international relations, however, it remains beyond the scope of this research.[84]

***391** 2. On the Changeability of the Patent Term

As stated above, while patent laws generally adopt the international standard pertaining to the patent term as prescribed by the TRIPS agreement, they also tolerate deviation from the standard twenty-year patent term. This has been most prevalent in relation to pharmaceutical patents, wherein patent term extensions have been rationalized on the basis of the lengthy administrative process that a pharmaceutical patentee has to endure to get his invention certified by the competent authorities in a given jurisdiction.[85] To date, various countries have sanctioned such extensions of the patent term.[86] The changeability of the patent term has also been manifested in another context, the "evergreening" of patents.[87] Patent systems that endorse ***392** this method allow for reapplying for an existing patented innovation citing sufficiently modified descriptions, claims or characters.[88] Such an application may be filed shortly before the expiration of the original patent term.[89] A third context in which a distinct patent term has been designated to a specific industry manifests itself in the Semiconductor Chip Protection Act of 1984, which provides a ten-year term for the engraved (etched) designs on microprocessor chips.[90]

From all of the above, it is possible to conclude that practical and social needs have dictated the introduction of exceptions to the rigid and arbitrary conventional twenty-year patent term. This demonstrates that the conventional patent term is not cast in stone and that regulators have acknowledged that the patent term needs to be attuned to other interests and yield to other constraints. This openness on the part of the regulators raises the question whether, by similar measure, the patent term concept needs to be ever-responsive to the dictates and needs of patent theory. I would answer this question with an unequivocal "yes." If patent terms have been responsive to bureaucratic considerations, then surely they must also be attuned to the underlying rationales of patent law. Indeed, if the patent term has been created to serve distinct social goals, then a synergy needs to exist between those underlying goals and the patent term. As discussed in the next section, economists have established a vivid connection between the patent term and the scope of patent protection. Consequently, despite the fact that the patent term appears to be technology-neutral, it is in fact attuned to technology-specific considerations.

***393 B. What Economists Teach Us About the Proper Patent Term**

As early as the 1960s, economists have questioned the logic underlying the largely uniform patent term.[91] The first and most widely recognized research was conducted by Nordhaus.[92] According to Nordhaus, the formulation of an optimal patent term requires reaching an equilibrium between the incentives necessary to encourage innovation and the inefficiencies associated with the monopoly right that constitutes the essence of the patent.[93] Specifically, Nordhaus's model employs various factors, mainly the cost of R&D, the social value of the invention, and the elasticity of demand.[94] Based on these, Nordhaus was able to calculate optimal patent lifetimes within a broad range (i.e., 1.1 years to thirty-four years).[95] The weakness of this model lies in the difficulty of calculating social values, especially ex ante. This state of affairs prompted Scherer to devise a more flexible version of Nordhaus's model, wherein case-specific patent extensions could be granted.[96] In his model, Nordhaus perceives a fixed point in time in which all investment in research and all innovations occur.[97] Duffy deems this flat approach to innovation as ***394** a further weakness in Nordhaus's model.[98] He advocates a fully dynamic approach to the patent term that can potentially impact the scope of and investment in innovation.[99] Regardless, the significance of Nordhaus's approach has been in transforming the patent term from a technical element within the patent system to a relevant balancing factor in the general patent scheme.

Another attempt to involve the patent term has been undertaken by Landes and Posner, who have asserted that "the length of a patent demonstrates the disjunction between actual and optimal protection."[100] Hopenhayn and Mitchell observe that in a world involving heterogeneous innovations, there is a need to provide a variety of patents by trading off patent breadth for length.[101] In their view, this tradeoff needs to be based on a "quality-ladder model" that considers the fertility of innovations and their role as building blocks to future inventions.[102] They contend that more fertile innovations get more returns for a shorter time.[103] Indeed, Burk and Lemley have provided empirical evidence as to differences between different industries with respect to innovation.[104] Burk and Lemley submit that industries vary from one another in various ways, including (but not limited to) the speed and cost of research, development, the ease with which inventions can be imitated by others, the need for cumulative or interpretative innovation rather than stand-alone development, and the extent to which patents cover entire products or merely components of products.[105] Furthermore, Mandeville contends that the system needs to ***395** take heed of the "economic characteristics of information."[106] Thus, a unified patent term is a problematic albeit convenient rule that needs to be changed. In this regard Mandeville has fittingly observed that "[a] new perspective on the patent system, indeed a new theory of the patent system is needed. Such a new perspective should begin with innovation. Innovation goes far beyond patents; there is much more to innovation than patents."[107] Gutterman provides a further point of leverage for utilizing the patent length mechanism. Indeed, the incentive-to-invent theory should be considered not so much from its monopoly aspects but rather from the correlation between the "anticipated rate of return on investments in the research required to generate new inventions," and the amount of said investments.[108] I also agree with Gwartney's observation that "[t]he consumer expectation in the high-tech world of today is that when a new technology is released, the cost will rapidly decrease within the first few years of availability."[109] He concludes that the "length of exclusivity in patent rights does not adequately mirror the expectations of society."[110]

To my mind, this type of perspective on the incentive to invent provides sufficient leeway for the regulator to mitigate excessive market control over the market of technology without substantially derogating from the socially desirable R&D activity done by the prospective patentee. In fact, this line of argument mimics earlier research that has pitted the private domain against the public domain. In this regard research has produced varying views on the topic. Indeed, according to Kitch's Prospect Theory, private property creates optimal utilization of a certain property item and is better than ownership that is shared by many.[111] When applied ***396** to patents, that argument would suggest that placing a patent in the private domain would optimize its utilization as compared to cases in which that same patent is placed in the public domain. Kitch has maintained that a system wherein patents award exclusive rights in discoveries encourages the inventor to invest in development without concern of the potential loss of his efforts to others.[112] Furthermore, this would encourage a potential innovator to expose the details of his innovation without fear of it being abused by others.[113] Kitch also contends that his theory promotes progress and innovation by enabling the benefits of research to be solely internalized by the innovators.[114] However, these propositions have encountered stiff opposition. For example, Gutterman has criticized Kitch's theory by asserting that it would create "serious risks that the technology would be underutilized and that the research efforts of rivals would be diverted to other, perhaps less promising, areas of activity."[115] Gutterman's criticism exposes a major flaw in the patent rationalization process: that innovation is primarily spurred by the power that is vested in the innovator.

Merges and Nelson contend that Kitch's Prospect Theory needs to be supplemented to make up for the limits of patent rights.[116] They observe that if the property rights are too narrow, then they "will not provide enough incentive to develop the asset."[117] Conversely, if those rights are overly broad, then they will "preempt too many competitive development efforts."[118] Landes and Posner caution that excessive patent protection can lead to reducing the benefits that society can harvest from the patent disclosure.[119] In their view "[t]he greater patent protection is, the smaller the benefit to competitors from the information contained in the patent grant because the less they can do with it."[120] In this regard, DeBrock concedes the ***397** existence of an optimal patent term that is the product of an underlying balance between the interests of the two groups.[121] In his view "the interaction of these two opposite forces implies a trade-off and the existence of an optimal patent life."[122]

In light of all of this, it is possible to conclude that economists have paved the way for recognizing the patent term as a relevant element in the "innovation" discourse. Indeed, economists demonstrate that length elements need to be factored into the equation to optimize the benefits that can be derived from this important public good that is broadly referred to as "innovation," and avoid its unwarranted arrest.[123] The question of how far the protection of innovation should be stretched forms the backbone of the ongoing debate relating to the scope of patent protection and the role of the patent term therein.[124] Despite their evident contribution to the debate, however, economists have left it to the lawyers to create workable legal rules for implementing a differential patent term model. The formulation of such an elusive rule remains the primary challenge and constitutes the inner core of my research.

C. Rationalizing a Differential Patent Term

The patent term exists in the law not as a relevant variable but rather as a constant that most have not questioned. Partnoy observes that "although no policy maker could set optimal patent policy by varying patent length, courts were free to set optimal patent policy by varying the boundaries of patent breadth."[125] Given this state of affairs, the conventional patent system has distorted the utilitarian nature of patent protection. First and foremost, a patent system that remains indifferent to the impact of the patent term on different patents leads to a situation in which ***398** patents having a very short commercial life span harness socially undesirable monopolies.[126] These patents will linger for twenty years without any commercial relevance, and in so doing they are likely to hamper the proliferation of knowledge and innovation into the market. This, in turn, cements the monopoly distortions of patent law and undermines its underlying utilitarian justifications. Johnson contends that a fixed term of twenty years, regardless of the innovation or the industry from which it comes, demonstrates that patent law has a "marked lack of sophistication."[127] On the flip side, the patent extension tool that is invoked by the law today fails to provide a clear and broad mechanism for all types of innovation. In other words, its application remains on the fringes of patent protection, is limited to specific cases, and lacks a set of clear standards as to how and when it can be applied. Moreover, the patent extension rules, by definition, have a limited capacity in that they do not facilitate any reduction in the patent term.

Another question that looms in this regard relates to the regulator's role in the innovation debate. In other words, should the regulator be expected to get involved in the way innovation is utilized and the way it is directed, or should this issue be left to market actors that are motivated by economic incentives and self interest? I would opt for the former. Indeed, despite early skepticism as to the role of the state in generating particular incentives in order to boost innovation,[128] it remains generally accepted that patent law formulated by the regulator assumes a significant role in generating incentives for innovation and in creating wealth for society at large.[129] ***399** Granted, in some cases there are those who will continue to engage in research and to seek innovation notwithstanding the lack of financial rewards that attached to the same.[130] This phenomenon is referred to in copyright discourse as romantic authorship.[131] Likewise, one cannot rule out what I would refer to as romantic innovation.[132] Nevertheless, the financial reward that is generally generated by the patent remains the primary engine of innovation.[133] What's more, that incentive also plays a pivotal role towards encouraging disclosure.[134] This, in turn, invigorates the proliferation of knowledge. Cornish observes that patents are intended to encourage inventions that are not only intended to be put to practical use but also to harness information that would otherwise remain undisclosed.[135] To my understanding, the best way to explain the nature of patents is by applying the metaphor of a social contract between the inventor and the collective, wherein the latter secures incentives to the benefit of the former to generate advantages for society at large.[136] As explained above, those incentives--which come in return for disclosure-- assume the form of a monopoly that is intended to stimulate prospective innovators to invest time, energy, and financial resources into research and development in the hopes of generating income that would be reaped by themselves. It follows that if this structure is indeed indicative of a classic contract between the innovator and society, then the patent grant (including its duration) should be subject ***400** to the assumptions underlying contract law,--namely, that a potential party will refrain from entering into a contract that does not serve its interests.[137] This also applies to the general will of society to grant a patent right to an inventor in return for his full disclosure of the technology. Indeed, society's "generosity" is propelled by its expectation to expand the aggregate social wealth.[138] Such social wealth, which is the accumulation of knowledge and innovation, is deemed to be contingent on providing sufficient incentives for all innovators (present and prospective) to continue engaging in research and development.[139]

In accordance with this line of thinking about the rationale of patent law, it is only natural to expect that society will refrain from endorsing any rule which expands the private domain without securing some measure of benefit for the public domain (society at large). Specifically, a lengthy patent term that does not impact the incentive to invent, or that prevents access to technology in a disproportionate manner, negates patent theory and is not merited. Such a term falls beyond the bounds of the above described social contract because it preserves social monopolization and maintains deadweight losses.[140] In my view, the monopolistic entitlements that are granted to the innovator need to be offset to evade undesirable social effects. The patent system needs to be attuned to social needs and the changing face of the innovation scene in science and technology. What has been cannot (and must not) remain as a matter of course but needs to evolve to justify itself through ***401** the prism of overall social needs and evolving reality. To my mind, patent protection was never just about granting a prize for innovators. That prize is merely a means to achieving a basic goal of encouraging innovation. In other words, the patent right is not a natural right that is vested in the innovator, but rather it is something bestowed upon him by society if and when (and so long as) society deems it fit.[141]

It could be claimed that there are two opposing views as to how one should consider the relationship between patent

protection and public benefit. On the one hand, it could be argued that in protecting patents to the fullest extent, the incentive to innovators would be raised and, consequently, society at large would gain from their respective innovations. On the other hand, a counterclaim could be that society would gain more if it were allowed to freely access and use existing technology and base new innovations on it. DeBrock has summarized this dissonance within the patent discourse:

> Granting the inventor a monopoly on the use of the discovery for a specified period of time eliminates the free-rider problem, thus restoring the incentive to invent. Extension of the duration of protection will increase incentives for private resource allocation toward technical advance. Unfortunately, extension of patent protection by definition brings with it the social inefficiencies recognized in a monopolistic market.[142]

As such, if society is to reconsider the duration of the patent term, it must do so not so much from the narrow viewpoint of the innovator, but rather from a wider social perspective that takes stock of the conflicting interests. Indeed, given that patent protection rests predominantly on utilitarian rationales, it is only natural to expect the regulator to seek to maximize social benefits, thereby realizing the full potential of that theory. The patent system, however, seems to have thus far missed the opportunity to achieve this pivotal goal that can ensure its continued public-good-oriented legitimacy. This is mainly because the patent system has resigned itself to a unified rule that provides for a predetermined patent term, and does not afford much attention to the fact that a wide array of distinctly different technologies are impacted by that rule. On its face, applying this "technology-neutral protection" to varying types of innovation appears to be a positive method in that it creates blanket ***402** coverage and ensures legal certainty. However, by overlooking the specific and diverse characteristics of different technology sectors, patent law cannot attain the underlying utilitarian purpose for which it was created in the first place.[143]

With that being said, a differential patent term appears to be a radical deviation from the widely accepted trend of unifying patent norms. Indeed, when reading patent laws around the world as well as the agreements that shape them (mainly TRIPS), it is evident that patent laws have been overwhelmingly influenced by a structured international framework comprising rules and standards that regulate the way in which patents are validated, protected, classified, and registered.[144] But while this unified patent system is deemed to be technology-neutral or even technologically-indifferent, on close examination it becomes evident that those involved in validating and invoking patent rights (the registrar, the courts, and the right holders) have formulated a clear distinction between the rules and the way in which they are applied.[145] Over time, research has concluded that patent law does indeed impact different industries in different ways. For example, Lemley observes that intellectual property rights "seem to promote innovation in some industries but harm innovation in others."[146] This problem is most evident in the areas of semiconductors, software, and telecommunications.[147] More specifically, there is a clear divergence between technologies relating to biotechnology and technologies relating to software.[148] In this regard, courts in the United States have reportedly ***403** been more inclined to find nonobviouness in patent applications relating to biotechnology, even if the prior art demonstrates a clear plan for producing the invention.[149] The courts have been generally inclined to offset this by imposing stringent enablement and written description requirements on biotechnology patents.[150] In patents relating to software, however, research identifies a different judicial trend. Here, the courts have effectively lowered the enablement and best mode requirements, but have raised the nonobviousness threshold.[151]

Another reason for invoking a differential patent length relates to the skepticism as to the impact of patent protection on innovation in different jurisdictions. Lerner has demonstrated, through expansive empirical research covering sixty countries, that strengthening patent protection does not appear to have influenced the scope of patent applications filed in some countries that have implemented such a policy change.[152] If, indeed, the strength of patent protection does not affect innovation beyond a certain critical point, that would be all the more reason to do away with any "redundant" patent term that is of no commercial use for the innovator while amounting to a burden on society and innovative activities by others. In light of Lerner's conclusion, my view is that such a differential patent term would eliminate these inefficiencies without derogating from the incentive to engage in R&D and innovation. This proposed approach would be easy to accept if we were to concede, as I think we should, that the patent system is not structured as a zero-sum game but rather as a potential win-win system.

A patent system that utilizes not only the patent breadth but also the patent length can best contribute towards optimizing patent protection. Basing the patent ***404** balance solely on the patent breadth is no longer a workable option. Indeed, the way in which the patent term has been historically crafted, as a "one term fits all," has been rendered obsolete. Applying a single term to all types of patents is not justified and stands contrary to the underlying rationales of patent protection as portrayed by the utilitarian theory. In this context Carroll argues that

[A]pplying a socially costly, uniform solution to problems of differing magnitudes means that the law necessarily imposes

uniformity cost by under-protecting those who invest, or would invest, in certain costly innovations and overprotecting those with low innovation costs or access to alternative apropriability mechanisms.[153]

This debate about the form of patent law also rests on the rules-versus-standards debate.[154] On the one hand it appears that the rules and exceptions provided in patent law make for a clear legal structure. However, applying standards, a more complicated process, would facilitate the necessary leniency capable of sustaining competing interests within the innovation domain. Duffy has observed that

Clear rules can provide the certainty that encourages investment . . . [in] rights, but standards can provide the flexibility to accommodate the new and unpredictable [innovations] . . . . Eventually, [such] rules always fail. . . . [Nevertheless,] [t]he short term certainty associated with rules may provide necessary, if temporary, safe harbors that allow property rights to thrive. . . . [I]n the long run, the repeated failures of patentable subject matter rules provide crucial insights into the meaning and process of invention in our society."[155]

It is worth noting that even in the distant past, much thought was given to the correct patent term and how to predict it. In fact, even before the United States' patent law came into being, two reasons were given for the limited-time monopoly grant: the introduction of new trade and industry and the intent to compensate the patentee for costs that he has incurred.[156] If the aim of the patent system is to promote innovation by providing innovators with the incentive to continue to engage in R&D, then the focus needs to be on how patent protection granted to innovators should be altered so as to maximize social benefit. In this context, Denicolo asserts ***405** that in deciding the length of the patent term, society needs to "balance the gains accruing from faster technological progress against the welfare loss that is associated with the temporary monopoly in the use of the new technology."[157] This is especially true given that the patent system is intended to regulate a wide expanse of innovation. In a nutshell, when innovations are heterogeneous (as they indeed are), it is advantageous to provide specifically tailored patent terms. The length of the patent goes to the heart of the issues relating to the allocation of resources--knowledge and innovation--among different stakeholders.[158] Therefore, there is a need to recalibrate the patent term in a case-sensitive, differential manner. This would leave sufficient incentives for prospective innovators to engage in research and in development without derogating from the proliferation of relevant technology into the innovation market. According to this approach, the unitary patent term rule should be substituted by predetermined standards that are more in tune with the technological realties and needs of the modern era. This would be of special benefit to consumers as well as the innovation market at large. Consequently, the next section is devoted to exploring ways of creating this change in practice.

D. Formulating a System Comprising Differential Patent Terms

As I have demonstrated thus far, the patent breadth and its exceptions are not sufficiently sophisticated to optimize patent protection. Therefore, to optimize patent protection, the patent length needs to be factored into the equation. To my mind, such a merger between length and breadth would achieve the necessary fine tuning that is needed and would more effectively contribute to maintaining the incentive for innovation while securing the proliferation of knowledge and access thereto. It is worth pointing out that my conclusions are not tantamount to an all-out attack on the patent system, nor do they reflect a denial of its virtues; rather, they attempt to revitalize the system in a manner that hones its abilities to achieve the socially optimal--thus desirable--level of patent protection.[159] As I have demonstrated, ***406** the twenty-year patent term constitutes an arbitrary rule that lacks firm theoretical justifications. Moreover, that rule stands contrary to the underlying rationales of patent theory. But even with the justifications for a synthesis between the patent length and the patent breadth, another challenge looms. This relates to the form and content of the patent length. While economists have considered this topic within their discipline, a comprehensive and practical legal rule has remained elusive. Having reached this point in the reasoning, it is now clear why there is a need to refashion the conventional patent term. Thus, the challenge remains to create clear and workable rules that would translate the conclusions of past research into practical rules.

1. Commercial Capacity: The Missing Link in Innovation

This section proposes a workable patent duration model that aims to attain the most socially desirable patent terms. My proposed model assumes that the starting point for addressing the patent term is to focus on the durability of the justification for its existence. The duration of the patent term needs to be contingent on maximizing the aggregate benefits of all social interests, including those of the innovator (patentee). For example, where innovator V is engaged in research and development activity at the rate of W because of Y benefits that accrue from the patent, then V will still engage in W even if

Y is reduced so long as his anticipated return is not substantially affected. Here, then, W will remain constant (or largely unchanged) as long as Y does not fall below a certain minimal threshold.

Consider a situation in which the innovator V knows that he can benefit commercially from his patented product for three years. In this case V will remain indifferent to any term of protection that is beyond the "commercial capacity" of his product, namely, three years. In other words, when aiming to create a patent term, one needs to consider the commercial capacity of the specific patented invention. One need not be a technology guru to know that the commercial duration of an electronic device is inherently different than that of a pharmaceutical invention. Whereas in the case of electronics, where technology becomes obsolete at a much faster pace because new gadgets are always being introduced, pharmaceutical preparations linger because of the (unfortunate) reality that ailments generally persist, transcend borders, and even reemerge.[160]

***407** Thus, a differential patent system that is contingent on commercial capacity would contribute towards greater harmony between how patent protection is applied and its underlying theoretical justifications. A differential patent term would enable patent law to "adapt to new technologies without losing its essential character" of protecting innovation.[161] And more importantly, it would allow patent law to edge closer towards optimal patent protection by honing in on the point in time at which all the incentives for R&D relating to a specific product are maximized. It is worth noting that previous research has also advocated for a more type-based approach to patent protection. Specifically, Thurow has distinguished between "fundamental advances in knowledge" vis-à-vis "extensions of existing knowledge."[162] In his view each of those merits a "different kind of patent."[163] Indeed, one can no longer ignore the fact that different technologies have distinct characteristics and that their commercial capacity in the market is not of a single nature.[164] This, together with the utilitarian justification that forms the backbone of patent theory, necessitates a change in the regulative system whereby the unified patent term is substituted with predetermined standards that are more in line with technological realities. According to my proposed model, the patent breadth is determined not only by the scope of formal patent rights that are granted to a certain patentee by patent law, but also by the commercial capacity of the patent. In this case, the patent breadth would be the sum of the patentee's legally recognized rights (R) and his invention's commercial capacity (C), namely, its duration of relevance in the pertinent field of technology.

In my view the general overall incentive for innovation is contingent on three factors: the patent length, the patentee's rights granted by law, and the commercial capacity of the product covered by the patent. But since in patent law the patent ***408** right is constant, and given that my proposed model assumes a constant level of incentive (I) for all innovators, the only variable left in the equation--that affects the patent length--is, in fact, the commercial capacity of the patent. Consequently, there is an inverse relationship between a patent's length and its commercial capacity. To better explain and justify this synthesis between the two spheres of protection (breadth and length), it would be helpful to envision a parallelogram whose area represents the overall reward (incentive) for innovation. Here, the cumulative scope of the incentive to innovate (I) is represented by the parallelogram's area. Understandably, the area of such a parallelogram is a result of the multiplication of its base by its height. In this regard, the height of the parallelogram (L) symbolizes the patent term, and the base of the parallelogram denotes the patent breadth (B). Therefore, the area (I) is equivalent to L*B. As I have explained above, (B) is comprised of two elements: the formal patent rights (R) and the commercial capacity of that innovation (C).

Therefore, the method to express this relationship between the factors is I = L*B = L*(R+C). It follows that L (the patent length) = I/(R+C). Given that I (the incentive to innovate) is constant for each given patent, and that the patent rights (R) are also constant in patent law, it is clear that there is an inverse relationship between the patent length and its commercial capacity. Thus, the only differential that can inversely affect the patent length is the invention's commercial capacity (C). Logically, then, it would be possible to construct the proper, optimal length for a given patent by identifying the distinct commercial capacity of the specific patented innovation. Therefore, the main challenge for determining the patent length reverts back to the elements that should be taken into account when determining the patent's commercial capacity. In this regard, I would resort to Gutterman's observation that there is a need to distinguish between an invention that "yields its various advantages quickly and achieves rapid acceptance in the market place" and an invention that has a "greater difficulty in achieving rapid acceptance."[165] While in the first case the patent term should be shortened, the latter case would necessitate extending the patent term.[166] That is because while in the first case an extension of the exclusive rights might "exacerbate the potential allocative problems of the original patent," in the latter case, there is a need to allow "sufficient time to recoup the development costs."[167] What follows is a list of the main ***409** elements that I believe should be considered when assessing the commercial capacity of a given invention:

•Ratio between the conventional patent term (of 20 years) and the projected scientific relevance of the technology (in years).

•Ratio between the successful patents in the specific technology and aborted research in that field of technology.

•Time that is needed in order to reap profits to cover the R&D investment.

•Cost of the investment that is required to bring the patent into commercial application.

•Time that is needed in order to devise the invention.

•Time that is needed in order to reach the commercialization stage of the patented product.

•Scope of the market (whether local or international).[168]

By calculating the commercial capacity of a patent, it would be possible to formulate specific patent terms for distinct types of innovations. In essence, the patent system would substitute its unified patent term rule with a system of differential patent terms. That new differential term would more accurately reflect the nature and achieve the purpose of the patent term in general patent theory. I emphasize that my proposed model involving differential patent terms is not necessarily intended to shorten the conventional twenty-year patent term in the case of every type of innovation. On the contrary, according to my proposed model it is possible to determine that for certain patents or fields of technology, a longer patent term is warranted. This model is especially relevant in the pharmaceutical sector, where the time between filing the patent application and receiving the patent registration is generally commercially worthless. Abramowicz has observed that "by the time market conditions make commercialization potentially attractive, the remaining patent term might be sufficiently short that a patentee will not develop an invention or will not spend as much on development as if more patent term remained."[169] Therefore, patent terms that are too short are likely to cause "patent underdevelopment," which manifests itself in a lack of incentive to engage in research and development.[170] This risk is further enhanced by the fact that in some cases the substantial threshold that a potential patentee needs to surmount also justifies ***410** extending the patent term.[171] In those cases, a lengthier patent term may be warranted to maintain a constant level of incentives for innovation. This would be compatible with general patent theory and would be in line with the rationales of the United States' Patent Term Extension Act and other similar laws around the world.[172]

2. On Minimizing the Projected Costs of Transition and Maintenance

Given the complexity of the elements that make up the commercial capacity of patents, it would probably be very problematic to apply those ad hoc determinations to every type of patent application. The cost of such determinations is likely to be cumbersome on the patent process, and the deadweight losses might indeed outweigh the system's anticipated benefits. It would also complicate the patent application process to an extent that would render it socially counterproductive.[173] Therefore, to simplify the task, I recommend creating or adopting a system for the classification of patents that would enable the user to identify the patent term depending on the type of patent (i.e., the class in which it is registered). Ideally, this proposed system of classification would dissect technology into various sections and subsections, each with its own distinct patent length. The relevant patent terms would be calculated and determined in advance based on variables and data that are relevant at the time.

However, my proposed model encounters a significant hurdle that needs to be overcome: how to classify the massive number of patents so as to achieve legal clarity for those engaged in innovation. Indeed, it appears as though such a system ***411** might itself be both costly and complicated. Gwartney has voiced a similar concern as to the implementation of the differential patent term, contending that

> Rather than simply granting every patent a term of twenty years, society may prefer a patent system that meritoriously awards innovation. Perhaps the patent system could award the inventor of an antigravitational device (that actually works) a patent term of fifty years, but to the inventor of a bathroom stall latch a patent term of five years. . . . In other words, the patent system could place value on how useful the invention is and award a patent term commensurate to that measure of usefulness. Overhauling the patent system, however, to have a multiplicity of types of patents would be legislatively difficult to implement and pragmatically complicated to practice.[174]

While Gwartney's observation has merit, Johnson has a much more optimistic outlook as to the possibility of altering the patent term without incurring too many costs and risks. More specifically, Johnson argues that "the simple numeric quality of duration means that the effects of its manipulation would be more predictable than manipulation of other variables would be."[175] He further contends that "[d]uration has a comfortable quality of facilitating an 'ease in' to change, in part because it

allows for on-going experimentation and adjustment with minimal risk."[176] Indeed, it is advisable to satisfy Gwartney's concerns by opting for a cheaper system in terms of implementation.

Another even more serious challenge that might come up against my proposed model emanates from the probable assumption that innovators cannot determine ex ante the application of their innovation. That is because some innovators may not be able to foresee the economic potential of their invention at the time of applying for a patent; only later can the innovator grasp the implications of his innovation. Furthermore, an innovation might be initially directed to one area of innovation but end up being applied in a wholly different area than was originally patented. What's more, some patents are more "generic" in nature to facilitate versatility in terms of additional applications of technology. Facially, these hurdles appear to undermine the proposed model in that its application in the ex ante sphere is at odds with the ex post nature of patent utilization. But upon closer examination, it is apparent that these hurdles can be circumvented. That is because my proposed concept of commercial capacity of innovation and the factors that it comprises do in fact allow for assigning the ex post effects for most types of innovation. ***412** Indeed, I anticipate cases in which the ex ante determinations will not suffice because of the dynamic nature of certain types of innovation. In those cases, there will be a need to introduce an exception mechanism. The next section includes the details of such a mechanism.

The application of my proposed model--comprising a differential patent term-- should not be deterred by short-term transition costs and exceptional cases that need to be addressed on their merits.

3. Nuts and Bolts of the Proposed Model

In my view, the cheapest system for attaining a viable classification of technology and innovation would be by resorting to the already existing classifications of patents as set by the Strasbourg Agreement Concerning the International Patent Classification of 1971, as amended in 1979 (IPC).[177] This agreement, to which sixty-one countries are now parties, is used by the patent offices of more than 100 countries, as well as by four regional offices and the secretariat of the World Intellectual Property Organization (WIPO) under the Patent Cooperation Treaty.[178] The IPC functions as a mechanism for the retrieval of patent documents when searching for prior art.[179] As such, it can assist patent-issuing authorities, potential inventors, research and development units, and others concerned with the application or development of technology. The international classification is dependable because it is continuously revised.[180] The classification applies to various documents relating to patents for invention, including published patent applications, inventors' certificates, utility models, and utility certificates.[181] It is open to ***413** all countries that are members of the Paris Convention.[182] The working languages of the agreement are English and French.[183] As such, this system of classification facilitates "an effective search tool for the retrieval of patent documents by intellectual property offices and other users, in order to establish the novelty and evaluate the inventive step or non-obviousness (including the assessment of technical advance and useful results or utility) of technical disclosures in patent applications."[184]

Furthermore, the IPC can be used to facilitate access to the technological and legal information contained therein.[185] Between 1974 and today, the IPC has been periodically revised "in order to improve the system and to take account of technical development."[186] Following the conclusion of its reform to "ensure its efficient and effective use in the electronic environment" in 2005, the IPC was divided into core and advanced levels.[187] Specifically, the core level is updated once every three years, and the advanced level is continually revised.[188] The system is sufficiently detailed to allow for a precise classification of all patentable subject matter.[189] It utilizes a detailed hierarchical structure of classification, with the highest part of that hierarchy being comprised of eight broad sections, designated A ***414** through H.[190] Each section carries a title that provides a broad description of the contents of that section:
A HUMAN NECESSITIES;

B PERFORMING OPERATIONS; TRANSPORTING;

C CHEMISTRY; METALLURGY;

D TEXTILES; PAPER;

E FIXED CONSTRUCTIONS;

F MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING;

G PHYSICS;

H ELECTRICITY.[191]
Each section is subdivided into classes which are the second hierarchical level of the Classification. . . . Each class symbol consists of the section symbol followed by a two-digit number [(e.g., H01)]. . . . The class title gives an indication of the content of the class [(e.g., H01 BASIC ELECTRIC ELEMENTS)]. . . . Each class[, in turn,] comprises one or more subclasses which are the third hierarchical level of the Classification. . . . The subclass title indicates as precisely as possible the content of the subclass [(e.g., H01S DEVICES USING STIMULATED EMISSION]. . . . Each subclass is broken down into subdivisions referred to as "groups", which are either main groups (i.e., the fourth hierarchical level of classification) or subgroups (i.e., lower hierarchical levels dependent upon the main ***415** group level of the Classification).[192] In all, the IPC creates approximately 70,000 subdivisions.[193]

The IPC's meticulous system of classification can be utilized as a basis for classifying innovations in terms of their duration, in accordance with the commercial capacity of those innovations. Ideally, the IPC's tools would create a situation wherein each type of patentable subject matter is allotted a clear patent duration that can be automatically applied to the patent once it is registered. For this purpose, the same body of experts entrusted with the task of classifying patents can now be delegated the task of entering the relevant duration for each patent classification. Understandably, the determination of the respective patent terms for each patent class using the commercial capacity factors may require consulting with experts who are familiar with the particular market at issue.

My proposed system of classification would need to address two more challenges: the possibility of multiple classifications for a single patent and the possibility of changes in the commercial capacity of a certain field of innovation. In my opinion, the first challenge can be resolved by opting for a system that would be contingent on the dominant technology that exists within the invention. As for the second challenge, I would propose a mechanism for the periodic review of commercial capacity. Thus, any change in the commercial capacity of a certain innovation can be immediately translated into a new duration for that innovation's corresponding patent classification.

In sum, the use of the existing IPC would entail fewer costs and could be more easily introduced into various nations' laws. The IPC's well-established structure within the international patent regulative framework makes it the cheapest and most accessible method for classifying technology for the purposes of my proposed model.

Notwithstanding my proposed model of patent term classification, the system will require sufficient flexibility to deal with patent applications that materialize in ***416** extraordinary circumstances. For this, I recommend including a special mechanism whereby the patent applicant can petition the patent office and request a lengthier patent term. This mechanism would provide an additional safety valve by allowing the patent registrar to override the initial basic patent term granted to the patentee (in accordance with my proposed model). In deciding whether to accept such an application the patent office would need to consider each case on its merits. Clearly, such an exception should be applied with discretion, lest it completely override the proposed model.

IV. Conclusion

If we continue to uphold the premise that patent protection is a tool for the advancement of social progress and prosperity, as I think we should, then the rules that formulate this protection need to reflect these aims. For many decades now, the patent system has opted for a straightforward scheme with a unified patent term for all technologies and forms of innovation. This system has existed despite a decades-old debate among scholars relating to the interrelationship between the patent breadth (scope of the right) and the patent length (term).

I have demonstrated that the present-day patent length factors consisting of patent rights and exceptions are insufficient. I have also demonstrated that the largely arbitrary twenty-year term of patent protection needs to be substituted with an integrated mechanism involving both the patent breadth and length. The diversity of modern technology prompts the need to recalibrate the patent term so as to optimize the social benefits that are attained by patent protection. This change in the

régime would support the aims of the underlying utilitarian theory that is a central pillar of patent discourse.

I have shown that to optimize patent protection, there is a need for a synergy between the length and breadth elements. In this regard, I have proposed basing the differential patent term on predetermined mechanisms of classification. The most obvious and efficient mechanism is the international classification as prescribed by the Strasbourg Agreement. I believe that the Strasbourg system can be used for classifying inventions in accordance with their commercial capacities and thus assist in calculating the length of their patent terms. Ultimately, this would help in transcending the theoretical stage in the debate and would pave the way towards achieving optimal patent protection.

Clearly, the intermediate transition to such a system would not come without costs. In my view, however, the long-term benefits outweigh the costs of transition and operation. My proposed system will better facilitate the proliferation of technology while maintaining a sufficient threshold for propelling and incentivizing innovation. At this junction, the optimal patent protection is achieved.

***417** Because of the patent breadth's limited capacity, it is quite evident that the patent length needs to be factored in. The patent term can play a cardinal role in the reformulation of a new and more pragmatic patent system. In this research, I offered reasons for this assertion and proposed a method for factoring the patent term element into the patent system.

The time has come for the patent system to move with the times. Time is of the essence.

Footnotes

a1 Lecturer, Faculty of Law, Tel Aviv University. This article was written while I was a Cegla Fellow. My sincere thanks go to the Cegla Center for Interdisciplinary Research of the Law, Tel Aviv University. My thanks to Hanoch Dagan, Ariel Porat Michael Birnhack and Barak Atiram for their remarks and comments. Also, my thanks to Amit Itay, my research assistant, for his research input during the initial stages of this project and for reviewing the final draft of this research.

aa1 Frank Partnoy, Finance and Patent Length 9 (Univ. San Diego Sch. of L., Law & Econ. Research Paper No. 19, 2001), available at http:// ssrn.com/abstract=285144.

1 For an overview of the various research projects and the diverging results that have resulted therefrom, see Tuomas Takalo, On the Optimal Patent Policy, 14 Finnish Econ. Papers 33, 33-35 (2001).

2 Joshua S. Gans & Stephen P. King, Patent Length and the Timing of Innovative Activity, 55 J. Indus. Econ. 772, 772 (2007).

3 See Richard Gilbert & Carl Shapiro, Optimal Patent Length and Breadth, 21 RAND J. Econ. 106, 111 (1990).

4 Id. at 107.

5 See Ted O'Donoghue, Suzanne Scotchmer & Jacques-François Thisse, Patent Breadth, Patent Life, and the Pace of Technological Progress, 7 J. Econ. & Mgmt. Strategy 1, 1 (1998); Donald J. Wright, Optimal Patent Breadth and Length with Costly Imitation, 17 Int'l J. Indus. Org. 419, 432 (1999).

6 See Vincenzo Denicolo, Patent Races and Optimal Patent Breadth and Length, 44 J. Indus. Econ. 249, 263 (1996) (submitting that "there is no presumption that either infinite or minimum patent length is most likely to be optimal").

7 David S. Abrams, Did TRIPS Spur Innovation? An Analysis of Patent Duration and Incentives to Innovate, 157 U. Pa. L. Rev. 1613, 1615 (2009).

[8] Dan L. Burk & Mark A. Lemley, Policy Levers in Patent Law, 89 Va. L. Rev. 1575, 1577 (2003).

[9] See Robert P. Merges & Richard R. Nelson, On the Complex Economics of Patent Scope, 90 Colum. L. Rev. 839, 840-41 (1990).

[10] Courts can influence results by applying the substantive rules in the law as well as the exceptions in law. 0See generally Edward R. Gold, The Reach of Patent Law and Institutional Competence, 1 U. Ottawa L. & Tech. J. 263, 267-71 (2003-04). Gold contends that the "marginalization of ethical and distributional concerns in patent discourse has been exacerbated by three (dubious) claims that courts, tribunals and legal commentators have offered to justify the judicial assumption of jurisdiction over patent eligibility for new classes of innovation: 1. that the determination of patent eligibility is merely a technical question of statutory interpretation; 2. that patenting is morally neutral; and 3. that the expansion of the patent regime is necessary for the development of technology-based industries.... To guarantee a more just use of technology, we must ensure that our patent laws both create and reflect desired social outcomes as determined by enlightened and competent authorities. Given the multiple and multifarious competing interests at stake in issues of patent eligibility over new classes of innovation, the judiciary lacks both the capacity and the competency to make such determinations." Edward R. Gold, Abstract, The Reach of Patent Law and Institutional Competence (Aug. 4, 2005), http://ssrn.com/abstract=764746.

[11] Burk & Lemley, supra note 8, at 1579.

[12] There are additional tools that are external to patent law that can also mitigate the monopoly right that patent law secures. The most significant of these is antitrust law. For more on the relationship between antitrust and intellectual property, see Louis Kaplow, The Patent-Antitrust Intersection: A Reappraisal, 97 Harv. L. Rev. 1813 (1984); see also Christina Bohannan & Herbert Hovenkamp, IP and Antitrust: Reformation and Harm 70 (Univ. Iowa Legal Studies Research Paper No. 09-16, 2009) available at http://ssrn.com/abstract=1377382 (discussing a situation involving a Pareto improvement).

[13] Agreement on Trade-Related Aspects of Intellectual Property Rights, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, 33 I.L.M. 1125, 1209-10 [hereinafter TRIPs].

[14] See Alan O. Sykes, TRIPs, Pharmaceuticals, Developing Countries, and the Doha "'Solution"' 16-24 (Univ. Chicago Law & Econ., Olin Working Paper No. 140, 2002), available at http://ssrn.com/abstract=300834 (discussing the benefits of compulsory pharmaceutical licensing); Hans H. Lidgard & Jeffery Atik, Facilitating Compulsory Licensing Under TRIPS in Response to the AIDS Crisis in Developing Countries 16-17 (Loyola Law School (Los Angeles) Legal Studies Paper No. 2005-18, 2005), available at http://ssrn.com/abstract=794228 (discussing compulsory licensing in the context of the AIDS crisis).

[15] "Patent troll" is a term used to describe patent holders who, at least roughly speaking, seek profit through licensing, rather than providing products or services themselves. See John M. Golden, Patent Trolls and Patent Remedies, 85 Tex. L. Rev. 2111, 2155-58 (2007). For more on patent trolls, see Robert E. Thomas, Vanquishing Copyright Pirates and Patent Trolls: The Divergent Evolution of Copyright and Patent Laws, 43 Am. Bus. L.J. 689, 733-38 (2006) (discussing the impact of patent trolls on patent reform).

[16] Franco Cugno & Elisabetta Ottoz, Static Efficiency of Compulsory Licensing: Quantity vs. Price Competition 1 (June 9, 2006), available at http://ssrn.com/abstract=907452.

[17] Id. at 9.

[18] See Pankaj Tandon, Optimal Patents with Compulsory Licensing, 90 J. Pol. Econ. 470, 470 (1982) (discussing compulsory licensing as a means of finding "optimal" scope of protection).

[19] See Colleen Chien, Cheap Drugs at What Price to Innovation: Does the Compulsory Licensing of Pharmaceuticals Hurt Innovation?, 18 Berkeley Tech. L.J. 853, 865-70 (2003); Amir H. Khoury, The "Public Health" of the Conventional International Patent Régime & the Ethics of "Ethicals": Access to Patented Medicines, 26 Cardozo Arts & Ent. L.J. 25, 37-40 (2008) (arguing for and against compulsory licensing in the pharmaceutical context).

[20] Troy L. Gwartney, Note, Harmonizing the Exclusionary Rights of Patents with Compulsory Licensing, 50 Wm. & Mary L. Rev. 1395, 1415-16 (2008).

[21] See Adam McBeth, When Nobody Comes to the Party: Why Have No States Used the WTO Scheme for Compulsory Licensing of Essential Medicines?, 3 N.Z. Y.B. Int'l L. 69, 90-96 (2006), available at http://ssrn.com/abstract=1076082.

[22] See Gail E. Evans, Strategic Patent Licensing for Public Research Organizations: Deploying Restriction and Reservation Clauses to Promote Medical R&D in Developing Countries 34 Am. J.L. & Med. 175, 185 (2008); see also Jeffery Atik & Hans H. Lidgard, Embracing Price Discrimination: TRIPS and the Suppression of Parallel Trade in Pharmaceuticals, 27 U. Pa. J. Int'l Econ. L. 1043, 1044 (2006); Robert Bird, and Daniel R. Cahoy, The Impact of Compulsory Licensing on Foreign Direct Investment: A Collective Bargaining Approach, 45 Am. Bus. L.J. 283, 300 (2008).

[23] Bird & Cahoy, supra note 22, at 300.

[24] Bird & Cahoy, supra note 22, at 300; see also Michael W. Nicholson, Intellectual Property Rights and International Technology Diffusion 4-17 (March 2002) (paper prepared for "Responding to Globalization" Conference at Boulder, CO), available at http://colorado.edu/IBS/PEC/gadconf/papers/nicholson.pdf; Nuno Pires de Carvalho, The TRIPS Regime of Patent Rights 153, 317 (2d ed. 2005).

[25] See Lidgard & Atik, supra note 14, at 16-17; Robert C. Bird, Can Compulsory Licensing Improve Access to Essential Medicines? 2 (Mar. 11, 2008), available at http://ssrn.com/abstract=1124035; see also McBeth, supra note 21, at 76.

[26] Bird, supra note 25, at 3 ("The challenge for poor governments is not whether to issue a compulsory license at all. Rather, the challenge is how poor governments can issue compulsory licenses that both maximize drug access and avoid unwanted side-effects.").

[27] See Tandon, supra note 18, at 470-71 (suggesting improvements to the compulsory licensing regime that will move protection toward optimal levels).

[28] Rebecca S. Eisenberg, Patents and the Progress of Science: Exclusive Rights and Experimental Use, 56 U. Chi. L. Rev. 1017, 1018-19 (1989); see also Alan Devlin, Restricting Experimental Use, 32 Harv. J.L. & Pub. Pol'y 599, 601 (2009); Ted Hagelin, Abstract, The Experimental Use Exemption to Patent Infringement: Information on Ice, Competition on Hold (Syracuse Univ. Coll. of Law, 2005), available at http://ssrn.com/abstract_id=776865 ("The Court of Appeals for the Federal Circuit has nearly eliminated the common law experimental use exemption to patent infringement under which patent subject matter can be used for research purposes. In doing so, the court has retarded innovation, competition and consumer welfare.").

[29] See Eisenberg, supra note 28, at 1018 n.6, 1019 n.8.

[30] That recognition is manifested by 35 U.S.C. § 271(e) of the Patent Act and was subsequently enacted as part of the Drug Price Competition and Patent Term Restoration Act of 1984. See 35 U.S.C. § 271(e) (2000); Drug Price Competition and Patent Term Restoration Act of 1984, Pub. L. No.98-417, 98 Stat. 1585 (codified at 21 U.S.C. § 355 and 35 U.S.C. §§ 156, 271).

[31] Merck KGaA v. Integra Lifesciences I, Ltd., 545 U.S. 193, 205-06 (2005) (holding that:
Basic scientific research on a particular compound, performed without the intent to develop a particular drug or a reasonable belief that the compound will cause the sort of physiological effect the researcher intends to induce, is surely not 'reasonably related to the development and submission of information' to the FDA. It does not follow from this, however, that § 271(e)(1)'s exemption from infringement categorically excludes either (1) experimentation on drugs that are not ultimately the subject of an FDA submission or (2) use of patented compounds in experiments that are not ultimately submitted to the FDA. Under certain conditions, we think the exemption is sufficiently broad to protect the use of patented compounds in both situations");

See also Bradley J. Olson, The Supreme Court's Merck KGaA v. Integra Lifesciences I, LTD. Opinion extends the Exemption from Infringement under Section 271(e)(1) to Biotechnology "Research Tools," 3 J. Int'l Biotechnology L. 16, 16, 19 (2006), available at http:// dicksteinshapiro.com/olsonb/ (follow "Publications" hyperlink; then follow the article's hyperlink located in one of the "2006" entries in the table).

[32] Richard Jahn, Comment, Experimental Use Exceptions: Changes in Research Tool Patent Protection in the United States and a Comparison to Japan, 30 Del. J. Corp. L. 925, 925 (2005).

[33] See id.

[34] Id.

[35] Ted O'Donoghue, Suzanne Scotchmer & Jacques-François Thisse, Patent Breadth, Patent Life, and the Pace of Technological Progress, 7 J. Econ. Mgmt. Strategy 1, 1 (1998).

[36] Id.

[37] See id.

[38] Id. O'Donoghue et al. draw a distinction between two different types of patent breadth, namely "lagging" and "leading" breadth. Id. at 1, 3. Lagging breadth protects against imitating, inferior products, while leading breadth protects against competition from higher quality products. Id.

[39] Stephen C. Glazier, Inventing Around Your Competitors' Patents, Managing Intell. Prop., July-Aug. 1995, at 10; Christine A. McDaniel, Inventing Around and Impacts on Modes of Entry in Japan: A Cross-Country Analysis of U.S. Affiliate Sales and Licensing 1-2 (U.S. Int'l Trade Comm'n, Working Paper No. 99-11-A, 1999), available at http://ssrn.com/abstract=198753.

[40] William M. Landes & Richard A. Posner, The Economic Structure of Intellectual Property Law 295 (2003).

[41] See generally McDaniel, supra note 39 (discussing how inventing around can be accomplished).

[42] See 1 Melvin V. Jager, Trade Secrets Law § 3:40 ("The disclosure of the trade secret information in an issued patent terminates the trade secret"). It is unclear, however, whether such conduct can benefit the innovator because his "secret" innovation is liable to be discovered (or rather uncovered) through reverse engineering. See John M. Golden, Principles for Patent Remedies, 88 Tex. L. Rev. 505, 552-23 (2010).

[43] See Bonito Boats, Inc. v. Thunder Craft Boats, Inc., 489 U.S. 141, 150-51 (1989) ("The federal patent system ... embodies a carefully crafted bargain for encouraging the creation and disclosure of new, useful, and nonobvious advances in technology and design in return for the exclusive right to practice the invention for a period of years.").

[44] David J. Brennan, The Evolution of English Patent Claims as Property Definers, 4 Intell. Prop. Q. 361, 397-99 (2005), available at http:// ssrn.com/abstract=938634; John M. Golden, Construing Patent Claims According to Their "Interpretive Community:" A Call for an Attorney-Plus-Artisan Perspective, 21 Harv. J.L. & Tech. 321, 376 n.268 (2008).

[45] McDaniel, supra note 39, at 1.

[46] See Stephen M. Maurer & Suzanne Scotchmer, The Independent Invention Defence in Intellectual Property, 69 Economica 535,

535 (2002) (discussing protection despite independent invention); Richard J. Gilbert and David M. Newbery, Preemptive Patenting and the Persistence of Monopoly, 72 Am. Econ. Rev. 514, 514 (1982).

47 For more on the effects of process patents, see Aaron S. Kesselheim & Michelle M. Mello, Medical Process Patents--Monopolizing the Delivery of Health Care, 355 New Eng. J. Med. 2036, 2036-40 (2006).

48 See generally Hanoch Dagan, The Social Responsibility of Ownership, 92 Cornell L. Rev. 1255, 1259-61 (2007) (providing an in-depth analysis of the interrelationship between property and social responsibility).

49 Khoury, supra note 19, at 41-42; see also Andrew Beckerman-Rodau, Patent Law--Balancing Profit Maximization and Public Access to Technology, 4 Colum. Sci. & Tech. L. Rev. 1, 3-4 (2002); Bryan C. Mercurio, TRIPs, Patents, and Access to Life-Saving Drugs in the Developing World, 8 Marq. Intell. Prop. L. Rev. 211, 214 (2004).

50 Patricia M. Danzon & Adrian Towse, Theory and Implementation of Differential Pricing for Pharmaceuticals, in International Public Goods and Transfer of Technology Under a Globalized Intellectual Property Régime 425, 426 (Keith E. Maskus & Jerome H. Reichman eds., 2005).

51 See Drug Price Competition and Patent Term Restoration Act of 1984, Pub. L. No. 98-417, 98 Stat. 1585 (codified at 21 U.S.C. § 355 and 35 U.S.C. §§ 156, 271); Henry Grabowski & John Vernon, Longer Patents for Increased Generic Competition in the U.S.: The Waxman-Hatch Act After One Decade, 10 PharmacoEcon. 110, 110 (1996), available at http:// ssrn.com/abstract=536322; Henry Grabowski & John Vernon, Longer Patents for Lower Imitation Barriers: The 1984 Drug Act, 76 Am. Econ. Rev. 195, 195 (1986); Richard A. Epstein & Bruce N. Kuhlik, Navigating the Anticommons for Pharmaceutical Patents: Steady the Course on Hatch-Waxman 2 (Univ. Chicago Law, Olin Law & Econ. Working Paper No. 209, 2004), available at http:// ssrn.com/abstract=536322.

52 Darren S. Tucker, FDA Citizen Petitions: A New Means of Delaying Generic Entry?, 20 Antitrust Health Care Chron. 10, 10 (2006); Ankur N. Patel, Comment, Delayed Access to Generic Medicine: A Comment on the Hatch-Waxman Act and the "Approval Bottleneck," 78 Fordham L. Rev. 1075, 1082-83 (2009).

53 Thomas Chen, Note, Authorized Generics: A Prescription for Hatch-Waxman Reform, 93 Va. L. Rev. 459, 465-66 (2007).

54 Nancy T. Gallini, The Economics of Patents: Lessons from Recent U.S. Patent Reform, 16 J. Econ. Persp. 131, 150 (2002).

55 Alan Gutterman, Innovation and Competition Policy 38-40 (1997).

56 See, e.g., Hanoch Dagan, Property and the Public Domain, 18 Yale J.L. & Hum. 84, 84-85 (2006); Hanoch Dagan, & Michael Heller, Conflicts in Property, 6 Theoretical Inquiries in L. 37, 37 (2005); Seungwoo Son, Selective Refusals to Sell Patented Goods: The Relationship Between Patent Rights and Antitrust Law, U. Ill. J.L. Tech. & Pol'y 109, 117 (2002); Hanoch Dagan, Exclusion and Inclusion in Property 29-30 (June 7, 2009), available at http:// ssrn.com/abstract=1416580 [hereinafter Dagan, Exclusion and Inclusion].

57 Son, supra note 56, at 117.

58 Son, supra note 56, at 151.

59 See generally Dagan, Exclusion and Inclusion, supra note 56.

60 Dagan, Exclusion and Inclusion, supra note 56, at 31.

[61] Dagan, Exclusion and Inclusion, supra note 56, at 31.

[62] See Adam Mossoff, Exclusion and Exclusive Use in Patent Law, 22 Harv. J.L. & Tech. 321, 325-26 (2009).

[63] Emeric Henry, Runner-up Patents: Is Monopoly Inevitable? 1 (Apr. 19, 2007), available at http://ssrn.com/abstract=922316.

[64] Id. at 2.

[65] Id. at 9.

[66] See id. at 2.

[67] Gallini, supra note 54, at 150.

[68] Gallini, supra note 54, at 150.

[69] Mark A. Lemley, An Empirical Study of the Twenty-Year Patent Term, 22 AIPLA Q.J. 369, 375-76 (1994); Frank Partnoy, Finance and Patent Length 6 (Univ. San Diego Sch. of L., Law & Econ. Research Paper No. 19, 2001), available at http://ssrn.com/abstract=285144 (2001).

[70] Terence Kealey, The Economic Laws of Scientific Research 42 (1996).

[71] Statute of Monopolies, 1623, 21 Jac. I, c.3.

[72] See Partnoy, supra note 69 at 6-7 (offering a historical explanation for the fourteen-year patent term, suggesting it might be associated with the length of an apprenticeship in England at the time (seven years), and that the inventor was deemed to need two apprentices to devise a patent, hence the 14-year patent term).

[73] Partnoy, supra note 69, at 8.

[74] Partnoy, supra note 69, at 8.

[75] Tyler T. Ochoa & Mark Rose, The Anti-Monopoly Origins of the Patent and Copyright Clause, 84 J. Pat. & Trademark Off. Soc'y 909, 928 (2002).

[76] Partnoy, supra note 69, at 9. For more on the legal history of the protection of patents and copyrights in the United States, see Edward C. Walterscheid, To Promote the Progress of Science and Useful Arts: The Anatomy of a Congressional Power, 43 IDEA 1 (2002), and see also Edward C. Walterscheid, The Remarkable--And Irrational--Disparity Between the Patent Term and the Copyright Term, 83 J. Pat. & Trademark Off. Soc'y 233 (2001). For an expansive survey of the legal history of the patent term, see Eric E. Johnson, Calibrating Patent Lifetimes, 22 Santa Clara Computer & High Tech. L.J. 269, 283, 290-92 (2006).

[77] Johnson, supra note 76, at 269 (stating that the current patent term is arbitrary and the result of entrenched historical accident).

78 Partnoy, supra note 69, at 8.

79 Partnoy, supra note 69, at 8.

80 Agreement on Trade-Related Aspects of Intellectual Property Rights, Including Trade in Counterfeit Goods, art. 33, Dec. 15, 1993, 33 I.L.M. 81, 1869 U.N.T.S. 332 ("The term of protection available shall not end before the expiration of a period of twenty years counted from the filing date."). For a discussion of the impact of the TRIPS patent term in the U.S., see Lemley, supra note 69, at 369. For more on the history of the patent term and the TRIPS agreement, see Abrams, supra note 7, at 1618-19.

81 Nicholas Gruen, Gerard Prior & Ian Bruce, Indus. Comm'n, Extending Patent Life: Is it in Australia's Economic Interests? v (1996), http:// www.pc.gov.au/__data/assets/pdf_file/0017/8900/patents.pdf.

82 See Michael D. Birnhack, Trading Copyright: Global Pressure on Local Culture, in The Development Agenda: Global Intellectual Property and Developing Countries 363 (Neil W. Netanel ed., 2008) (arguing that the global copyright regime (G©) should be evaluated against the backdrop of a complex set of factors that form each country's cultural field, instead of being based on an exclusive legal or economic inspection); Michael D. Birnhack, Global Copyright, Local Speech, 24 Cardozo Arts & Ent. L.J. 491, 492-94 (2006) (analyzing the impact of globalization on copyright law).

83 Carlos Correa, TRIPS and TRIPS-Plus Protection and Impacts in Latin America, in Intellectual Property, Trade and Development: Strategies to Optimize Economic Development in a TRIPS-Plus Era 221-22 (Daniel Gervais ed., 2007); Lester C. Thurow, Needed: A New System of Intellectual Property Rights, Harv. Bus. Rev., Sept.-Oct. 1997, at 94, 96.

84 For more on the intersection between globalized patent standards and developing countries see Khoury, supra note 19, at 25-70, and Michael D. Birnhack, Global Copyright, Local Speech, 24 Cardozo Arts & Ent. L.J. 491, 491-506 (2006).

85 See Chuck Ludlam, Vice President for Gov't Relations, Biotechnology Indus. Org. (BIO), Testimony before the House Subcommittee on Courts and Intellectual Property Regarding the Patent Term for Biotechnology Inventions: Protecting Diligent Patent Applications (March 25, 1999), http:// www.bio.org/ip/action/tstm032599.asp ("BIO supports amendments to the patent law that, above all, ensure that diligent patent applicants are not penalized for delays which are beyond their control.").

86 See 35 U.S.C. § 156 (2006); Jaclyn L. Miller, Drug Price Competition and Patent Term Restoration Act: The Elimination of Competition between Drug Manufacturers, 5 DePaul J. Health Care L. 91, 106-07 (2002). In addition to the United States, other countries provide for extended patent terms for pharmaceuticals, including Australia, Japan, Korea, Israel, and many EU members. Grace Chen, David Tadgell & Virginia Beniac-Brooks, Pharmaceutical Patent--Extension of Term Provisions Around the World, IPOrganizers: DrugTerm, Nov. 2007, http://www.drugterm.com/country/world.htm. Despite an absence of internationally agreed-upon standards relating to these extensions, it is possible to identify some common features among the respective rules in the above mentioned countries. In this regard, DrugTerm identifies some common characteristics. See id. ("Extension is not automatic; the patent owner must make a specific application; [t]he length of the extension granted depends on the length of time between the date of filing of the patent application and the date of marketing approval; [a] maximum extension of 5 years is provided for; and [t]he rights of the patent owner in respect of the patent are usually limited during the extended term compared with the rights available during the original term."); Ministry of Economic Development, Review of the Patents Act 1953: The Pharmaceutical Patent Term in New Zealand 17 app. 1 (Regulatory & Competition Policy Branch, 2003), available at http:// www.med.govt.nz/upload/4186/pharamceuticalpatent.pdf.

87 Michelangelo Temmerman, The TRIPS Agreement, the Evergreening of Patents and Access to Medicines: Novartis v. India 1 (NCCR Trade Regulation, Swiss Nat'l Centre of Competence in Research,Working Paper No. 2008/16, 2008), available at http://ssrn.com/abstract=1185282 ("The Evergreening of patents (basically referring to the situation in which an already patent-protected invention is re-applied under slightly modified descriptions, claims or characteristics shortly before the expiry of the 'original' patent) is a phenomenon affecting one of the major cogs in the wheel of patent balancing: the (20 year) term."); see also Thomas A. Faunce & Joel Lexchin, 'Linkage' Pharmaceutical Evergreening in Canada and Australia, 1 Austl. & N.Z. J. Health Pol'y 8, 8 (2007), available at http://ssrn.com/abstract=1405010 [hereinafter Faunce & Lexchin, Linkage]; Thomas A.

Faunce, New Forms of Evergreening in Australia: Misleading Advertising, Enantiomers and Data Exclusivity: Apotex v. Servier and Alphapharm v. Lundbeck, 12 J.L. & Med. 220, 220-32 (2008), available at http://ssrn.com/abstract=1405024 [hereinafter Faunce, New Forms].

88 Temmerman, supra note 87, at 2; see also Faunce & Lexchin, Linkage, supra note 87, at 10; Faunce, New Forms, supra note 88, at 231.

89 Temmerman, supra note 87, at 1. In this regard, Temmerman submits that the tackling of evergreening is possible within the traditional patentability requirements and no additional legal action is actually required. Temmerman, supra note 87, at 2; see also Shanti Kumar, Nitin Shukla, & Tanushree Sangal, Evergreening of Patents and Indian Patents Law (June 15, 2009), available at http://ssrn.com/abstract=1420003.

90 Semiconductor Chip Protection Act of 1984, 17 U.S.C. §§ 901-14 (1985). For more on protection for computer software, see Peter S. Menell, Tailoring Legal Protection for Computer Software, 39 Stan. L. Rev. 1329, 1364-65 (1987).

91 See Glynn S. Lunney, Jr., Patent Law, the Federal Circuit and the Supreme Court: A Quiet Revolution, 11 Sup. Ct. Econ. Rev. 1, 47 (2004). Partnoy has called for reducing the patent term. See Partnoy, supra note 69, at 1; see also Yehuda Kotowitz & Paul Schure, The Optimal Patent Length 1 (March 2006), available at http://economics.huji.ac.il/seminars/seminars05-06/schure.pdf (arguing that "there are significant welfare losses when picking a longer than optimal patent length" and that "the current patent life of 20 years is far too long and reduces welfare significantly").

92 See, e.g., William D. Nordhaus, Invention, Growth and Welfare: A Theoretical Treatment of Technological Change (1969) [hereinafter Nordhaus, Invention]; William D. Nordhaus, The Optimum Life of a Patent: Reply, 62 Am. Econ. Rev. 428, 428 (1972) [hereinafter Nordhaus, Reply] (finding that the level of welfare generated by the patent system was very insensitive to the life of the patent once the term reached six to ten years); William D. Nordhaus, The Optimal Life of a Patent 1 (Cowles Found. for Research in Econ. At Yale Univ., Discussion Paper No. 241, 1967), available at http:// cowles.econ.yale.edu/P/cd/d02a/d0241.pdf [hereinafter Nordhaus, Optimal].

93 See Nordhaus, Optimal, supra note 92, at 2.

94 See Kenneth W. Dam, The Economic Underpinnings of Patent Law, 23 J. Leg. Stud. 247, 257 (1994); Edmund W. Kitch, The Nature and Function of the Patent System, 20 J.L. & Econ. 265, 284-85 (1977); Nordhaus, Reply, supra note 92, at 428; F.M. Scherer, Nordhaus' Theory of Optimal Patent Life: A Geometric Reinterpretation, 62 Am. Econ. Rev. 422, 424 (1972).

95 Nordhaus, Invention, supra note 92, at 81-82.

96 Scherer, supra note 94, at 422.

97 See Nordhaus, Reply, supra note 92, at 429.

98 John F. Duffy, A Minimum Optimal Patent Term 1 (Jan. 22, 2003), available at http://ssrn.com/abstract=354282.

99 Id. at 2.

100 Landes & Posner, supra note 40, at 300.

101 Hugo A. Hopenhayn & Matthew F. Mitchell, Innovation Variety and Patent Breadth, 32 RAND J. Econ. 152, 153 (2001).

[102] Id. at 157, 163. Other research that explores the length (term) rather than the breadth (scope) of patents approaches the topic from a fiscal financial angle, namely interest rates. See Partnoy, supra note 69, at 5. Here too the view is that "the optimal patent term is highly sensitive to changes in the term structure of interest rates and to changes in the timing of cash outflows and inflows related to patents." Partnoy, supra note 69, at 5. Partnoy contends that "under certain assumptions a one percent shift in interest rates results in an approximately one-year shift in the optimal patent term." Partnoy, supra note 69, at 5.

[103] Hopenhayn & Mitchell, supra note 102, at 156.

[104] Burk & Lemley, supra note 8, at 1604-07.

[105] Burk & Lemley, supra note 8, at 1577.

[106] Thomas Mandeville, Understanding Novelty: Information, Technological Change and the Patent System 91 (1996).

[107] Id. at 35.

[108] Gutterman, supra note 55, at 37.

[109] Gwartney, supra note 20, at 1438.

[110] Gwartney, supra note 20, at 1438.

[111] See Kitch, supra note 94, at 266. For more on Kitch's Prospect Theory, see Martin Campbell-Kelly & Patrick Valduriez, An Empirical Study of the Patent Prospect Theory: An Evaluation of Antispam Patents 1 (Sept. 1, 2005), available at http://ssrn.com/abstract=796289. In their article, Campbell-Kelly and Valduriez note that the concept of a prospect theory was first proposed by Edmund Kitch in 1977. See id. at 2. In fact, "[a]t the time that Kitch was writing, the 'reward theory' had dominated economic discussions of the patent system for many years. The reward theory posited that a patent served to motivate inventors by rewarding them with a temporary monopoly on an invention. This, inter alia, would enable the inventor to commercialize the invention without fear of rapid imitation; it would allow the inventor 'breathing space' to assemble the resources needed for commercialization; and the tradable instrument of a patent would facilitate negotiations for financial and other resources." Id.

[112] Kitch, supra note 94, at 266.

[113] Kitch, supra note 94, at 266.

[114] Kitch, supra note 94, at 266.

[115] Gutterman, supra note 55, at 62.

[116] Merges & Nelson, supra note 9, at 875.

[117] Merges & Nelson, supra note 9, at 875.

[118] Merges & Nelson, supra note 9, at 875.

[119] Landes & Posner, supra note 40, at 299.

[120] Landes & Posner, supra note 40, at 299.

[121] See Lawrence M. DeBrock, Market Structure, Innovation, and Optimal Patent Life, 28 J.L. & Econ. 223, 223-24 (1985).

[122] Id.

[123] See Takalo, supra note 1, at 39. Takalo outlines the imminent clash within the patent system between the diverging interests that are involved. In his view the public good aspect of intellectual property constitutes a "pervasive obstacle" in seeking the optimal technology policy because while intellectual property does not wear out, not securing a return for the innovator will reduce the scope of innovation in the economy. Takalo, supra note 1, at 33.

[124] See Simone A. Rose, Patent "Monopolyphobia": A Means of Extinguishing the Fountainhead?, 49 Case W. Res. L. Rev. 509, 511 (1999) (discussing whether intellectual property rights are property or monopoly, and contending that patent protection does not confer monopoly power on the grantee but instead contributes towards increasing market competition by increasing the number of options that are available to the consumer).

[125] Partnoy, supra note 69, at 11.

[126] Johnson, supra note 76, at 269.

[127] Johnson, supra note 76, at 282.

[128] See Gutterman, supra note 55, at 37 n.2. Gutterman observes that "[a] number of writers have argued that new inventions will arise independent of any state incentives or property rights awards whenever the state of basic knowledge or other social conditions are favorable." Gutterman, supra note 55, at 37. In this regard Gutterman refers to research dating back to the period 1923-1940. Gutterman, supra note 55, at 37 n.2.

[129] See Gwartney, supra note 20, at 1438 ("The patent system needs tweaking to serve better the interests across more industries that rely on it. Patents exist to promote progress, but ultimately the desire to promote progress is to benefit society."); Beckerman-Rodau, supra note 49, at 4. In this context it is worth noting that monopoly is not the only possible model for incentivizing innovation. For example, Shavell and Van Ypersele propose supplementing the grant of monopoly rights (which entail deadweight losses) with a reward system that is administered and funded by government. See Steven Shavell & Tanguy Van Ypersele, Rewards Versus Intellectual Property Rights, 44 J.L. & Econ. 525, 537-41 (2001). Johnson, however, is skeptical of this proposed reward system. He points out that it has weaknesses, namely, administration, determining worth, and deciding which innovations merit reward. See Johnson, supra note 76, at 273. Kaplow has also voiced skepticism, citing the difficulty of determining the reward. See Kaplow, supra note 12, at 1820.

[130] See Gutterman, supra note 55, at 37.

[131] See Anupam Chander & Madhavi Sunder, The Romance of the Public Domain, 92 Cal. L. Rev. 1331, 1339 (2004).

[132] See Edwin Mansfield, Patents and Innovation: An Empirical Study, 3212 Mgmt. Sci. 172, 174 (1986) (finding that innovative activity is not contingent on patent protection).

[133] See Bonito Boats, Inc. v. Thunder Craft Boats, Inc., 489 U.S. 141, 150-51 (1989) ("The federal patent system ... embodies a carefully crafted bargain for encouraging the creation and disclosure of new, useful, and nonobvious advances in technology and design in return for the exclusive right to practice the invention for a period of years.").

[134] Id.

[135] W.R. Cornish, Intellectual Property: Patents, Copyright, Trade Marks and Allied Rights 79 (2d ed.1989) ("[Patents] are intended to encourage the making of inventions and the subsequent innovative work that will put those inventions to practical use; and they are expected to procure information about the inventions for the rest of the industry and the public generally, which otherwise might be withheld, at least for a period that could be crucial.").

[136] See Leslie G. Restaino, Steven E. Halpern & Eric L. Tang, Patenting DNA-Related Inventions in the European Union, United States and Japan: A Trilateral Approach or a Study in Contrast?, 2003 UCLA J.L. & Tech. 2, (2003); see also Carl Moy, 1 Moy's Walker on Patents § 1:37 (4th ed. 2007).

[137] Vincenzo Denicolo & Luigi A. Franzoni, The Contract Theory of Patents, 23 Int'l Rev. L. & Econ. 365, 366-69 (2003), available at at http:// ssrn.com/abstract=516723.

[138] See Roberto Mazzoleni & Richard R. Nelson, Economic Theories About the Benefits and Costs of Patents, 32 J. Econ. Issues 1031, 1038 (1998) (questioning the purpose of patents if they do not induce inventions); Kitch, supra note 94, at 265 (arguing that the patent system functions to increase output from resources).

[139] There are additional economic theories of patents that can potentially impact the elusive optimization of patent protection. In this context, Mazzoleni and Nelson advocate three theories (in addition to "motivation for useful invention") that can account for the benefits and costs of awarding patents for invention: disclosure, commercializing inventions, and exploring "broad prospects." Mazzoleni & Nelson, supra note 138, at 1033. These theories share one common denominator that fixates on the indirect economic benefits that accrue to society as a result of patent protection. See Mazzoleni & Nelson, supra note 138, at 1033. The theories converge in their tendency to favor extending the patent term. See Mazzoleni & Nelson, supra note 138, at 1033-44. The fourth theory discussed by Mazzoleni and Nelson (Broad Prospects) is in essence the Prospect Theory. See Mazzoleni & Nelson, supra note 138, at 1042. In their view, patents enable orderly development of broad patents because "an initial discovery or invention is seen as opening up a whole range of follow-on developments or inventions." Mazzoleni & Nelson, supra note 138, at 1042.

[140] See Johnson, supra note 76, at 301(noting that loss to social welfare is one side of patent policy equation).

[141] This is also clearly reflected in the nature of patent rights, namely, that they are predominantly negative rights. They bar others from using what is patented within the relevant jurisdiction. See United States Patent and Trademark Office, Nature of Patent and Patent Rights, http:// www.uspto.gov/web/offices/pac/doc/general/nature.htm (last visited Mar. 19, 2010). Patent rights do not grant a patentee a positive right to use the patented subject matter. Id.

[142] DeBrock, supra note 121, at 223.

[143] Consider, for example, the nonlinear relationship between value and number of patents among holders of patent portfolios. See Gideon Parchomovsky & R. Polk Wagner, Patent Portfolios, 15 U. Pa. L. Rev. 1, 4-5 (2005).

[144] See, e.g., Paris Convention for the Protection of Industrial Property, July 19, 1967, 21 U.S.T. 1583, 828 U.N.T.S. 305 [hereinafter Paris Convention]; Patent Cooperation Treaty, June 19, 1970, 28 U.S.T. 7645, 1160 U.N.T.S. 231; Budapest Treaty on the International Recognition of the Deposit of Microorganisms for the Purposes of Patent Procedure, Apr. 28, 1977, 32 U.S.T. 1241, 1861 U.N.T.S. 361; Agreement on Trade-Related Aspects of Intellectual Property Rights, Apr. 15, 1994, 1869 U.N.T.S. 299; Patent Law Treaty, June 1, 2000, 39 I.L.M. 1047; Strasbourg Agreement Concerning the International Patent Classification Mar.

24, 1971, 26 U.S.T. 1793, 1160 U.N.T.S. 483.

145 See Dan L. Burk & Mark A. Lemley, Is Patent Law Technology-Specific?, 17 Berkeley Tech. L.J. 1155, 1156 (2002) (arguing that patent law is technology-specific in application).

146 Mark A. Lemley, Intellectual Property Rights and Standard-Setting Organizations, 90 Cal. L. Rev. 1889, 1892 (2002).

147 Id. (proposing the assistance of standard-setting organizations in order to ameliorate the problems of overlapping intellectual property rights in industries in which IP is most problematic for innovation, particularly the industries of semiconductors, software, and telecommunications).

148 Burk & Lemley, supra note 145, at 1156.

149 Burk & Lemley, supra note 145, at 1156.

150 Burk & Lemley, supra note 145, at 1156. ("Much of the variance in patent standards is attributable to the use of a legal construct, the 'person having ordinary skill in the art' (PHOSITA), to determine obviousness and enablement. The more skill those in the art have, the less information an applicant has to disclose in order to meet the enablement requirement--but the harder it is to meet the nonobviousness requirement. The level of skill in the art affects not just patent validity, but also patent scope.").

151 See Burk & Lemley, supra note 145, at 1162-68.

152 See Mariko Sakakibara & Lee Branstetter, Do Stronger Patents Induce More Innovation? Evidence from the 1988 Japanese Patent Law Reforms, 32 RAND J. Econ. 7798-99 (2001) (finding no innovation increase due to stronger patents); Josh Lerner, Patent Protection and Innovation Over 150 Years, 28 Nat'l Bureau of Econ. Research, Working Paper No. W8977, 2002), available at http:// ssrn.com/abstract=315327 ("[T]he failure of domestic patenting to respond to enhancements of patent protection, and the particularly weak effects seen in developing nations, were quite striking.").

153 Michael W. Carroll, One for All: The Problem of Uniformity Cost in Intellectual Property Law, 55 Am. U. L. Rev. 845, 847 (2006).

154 See John F. Duffy, Rules and Standards on the Forefront of Patentability, 51 Wm. & Mary L. Rev. 609, 611, 614-15 (2009).

155 Id.

156 Edward C. Walterscheid, Defining the Patent and Copyright Term: Term Limits and the Intellectual Property Clause, 7 J. Intell. Prop. L. 315, 324 (2000).

157 Vincenzo Denicolo, The Optimal Life of a Patent When the Timing of Innovation is Stochastic, 17 Int'l J. Indus. Org. 827, 827 (1999).

158 See Michael White, Why a Seventeen-Year Patent, 38 J. Pat. Off. Soc'y 839, 839, 859 (1956) (proposing a patent term that is shorter than seventeen years); L. James Harris & Regan J. Fay, Certain Incontestable Patents Are Warranted, 60 J. Pat. Off. Soc'y 27, 27 (1978) (proposing a dual patent system in which long-term patents would be granted for seventeen years and short-term patents for seven years).

159 See Richard A. Epstein, Why Libertarians Shouldn't Be (Too) Skeptical About Intellectual Property 11 (Progress & Freedom

Found., Progress on Point, Paper No. 13.4, 2006), available at http://ssrn.com/abstract=981779 (arguing that the law of intellectual property "should be subject to constant analysis and review, but not to any a priori attack on the supposed inferiority of intellectual property rights to those in tangible objects").

160 What's more, the variant effect of patent protection is not only industry-specific but also innovator-specific (i.e. that its impact depends, also, on the identity of the innovator, be it a large corporation, a single personally financed innovator, etc.). In this regard, Gutterman observes that given the "broad range of actors," it may be necessary to "provide a diverse range of possible incentives." Gutterman, supra note 55, at 44 ("Just as the importance of patent protection varies between industries, one must remember that patents may prove to be more valuable incentives to certain groups of inventors.").

161 Burk & Lemley, supra note 145, at 1157.

162 Thurow, supra note 83, at 98.

163 Thurow, supra note 83, at 98.

164 Gutterman, supra note 55, at 42 ("Even if it is conceded that patents do provide some significant incentive for inventive activities, it appears that the actual importance of patent protection will vary depending on the industry sector.") (referring to Christopher T. Taylor and Aubrey Silberston, The Economic Impact of the Patent System: A Study of the British Experience 26 (1973)).

165 Gutterman, supra note 55, at 67.

166 See Gutterman, supra note 55, at 67.

167 Gutterman, supra note 55, at 67.

168 See generally Johnson, supra note 76, at 293-96.

169 Michael Abramowicz, The Problem of Patent Underdevelopment 1 (George Washington Univ. Law Sch. Pub. Law & Legal Theory, Working Paper No. 179, 2005), available at http://ssrn.com/abstract=873473.

170 Id.

171 See id. at 8. Abramowicz suggests that patent protection needs to be contingent on the showing of a substantial degree of achievement before patenting. This notion has taken root in the United States wherein the USPTO's utility guidelines move to a four-pronged test for utility: if the invention has a well-established, specific, substantial, and credible utility. The operative result of such an approach is the deferral (or complete refusal) of the patent grant. See Notice, United States Patent and Trademark Office Revision of Utility Examination Guidelines, 66 Fed. Reg. 1092, 1095 (Jan. 5, 2001), available at http://www.uspto.gov/web/offices/com/sol/notices/utilexmguide.pdf.

172 See Drug Price Competition and Patent Term Restoration Act of 1984, Pub. L. No.98-417, 98 Stat. 1585 (codified at 21 U.S.C. § 355 and 35 U.S.C. §§ 156, 271); Wendy H. Schacht & John. R. Thomas, Pharmaceutical Patent Term Extensions: A Brief Explanation, 1-2 (2002), available at https://www.policyarchive.org/handle/10207/3565 (follow "View Publication" hyperlink on right side of page).

173 Johnson, supra note 76, at 293-94 (pointing out that the challenge relates to formulating clear categories for defined groups inventions).

[174] Gwartney, supra note 20, at 1398-99 (footnotes omitted).

[175] Johnson, supra note 76, at 289.

[176] Johnson, supra note 76, at 289.

[177] Strasbourg Agreement Concerning the International Patent Classification, Mar. 24, 1971, 26 U.S.T. 1793, 1160 U.N.T.S 483 [hereinafter Strasbourg Agreement].

[178] See World Intellectual Property Organization, Treaties Statistics, http://www.wipo.int/treaties/en/statistics/StatsResults.jsp?treaty_id=11 (follow "List of Contracting Parties*" hyperlink) (last visited Mar. 20, 2010); World Intellectual Property Organization, Summary of the Strasbourg Agreement Concerning the International Patent Classification (1971), http:// www.wipo.int/treaties/en/classification/strasbourg/summary_strasbourg.html (last visited Mar. 20, 2010) [hereinafter Summary].

[179] See Strasbourg Agreement, supra note 177.

[180] See Summary, supra note 178 ("The revision is carried out by a Committee of Experts set up under the Agreement. All states party to the Agreement are members of the Committee of Experts."). The current ninth edition entered into force on Jan. 1, 2009. World Intellectual Property Organization, Guide to the IPC 2 (2009), http:// www.wipo.int/export/sites/www/classifications/ipc/en/guide/guide_ipc_2009.pdf [hereinafter Guide].

[181] Guide, supra note 180, at 1.

[182] Summary, supra note 178; see also Paris Convention, supra note 146.

[183] Strasbourg Agreement, supra note 177, at art. 3, P 2. Pursuant to Article 3(2) of the Strasbourg Agreement, official texts of the Classification may be established in other languages. Strasbourg Agreement, supra note 177, at art. 3, P 2.

[184] Guide, supra note 180, at 1. "The text of the first edition of the Classification was established pursuant to the provisions of the European Convention on the International Classification of Patents for Invention of 1954. Following the signing of the Strasbourg Agreement, the International (European) Classification of Patents for Invention, which had been published on September 1, 1968, was as of March 24, 1971, considered and referred to as the first edition of the Classification." Guide, supra note 180, at 1.

[185] Guide, supra note 180, at 1. Its other aims are to include the creation of "a basis for selective dissemination of information to all users of patent information[,] a basis for investigating the state of the art in given fields of technology[,] [and] a basis for the preparation of industrial property statistics which in turn permit the assessment of technological development in various areas." Guide, supra note 180, at 1.

[186] Guide, supra note 180, at 2.

[187] Guide, supra note 180, at 2.

[188] Guide, supra note 180, at 2.

[189] Guide, supra note 180, at 3.

[190] Guide, supra note 180, at 3.

[191] Guide, supra note 180, at 3 ("Each section title is followed by a summary of the titles of its main subdivisions.... Within sections, informative headings may form subsections, which are titles without classification symbols.") For example, "Section A (HUMAN NECESSITIES) contains the following subsections:
AGRICULTURE
FOODSTUFFS; TOBACCO
PERSONAL OR DOMESTIC ARTICLES
HEALTH; AMUSEMENT.
Guide, supra note 180, at 3.

[192] Guide, supra note 180, at 3-4. "Most subclasses have an index which is merely an informative summary giving a broad survey of the content of the subclass. The electronic version of the IPC allows users to view the content of a subclass also by order of complexity of the subject matter." Guide, supra note 180, at 4. Each group symbol consists of the subclass symbol followed by two numbers separated by an oblique stroke [(e.g., H01S 3/00)]." Guide, supra note 180, at 4.

[193] Summary, supra note 178. "The appropriate IPC symbols are indicated on patent documents (published patent applications and granted patents), of which over 2,000,000 are issued each year. The appropriate symbols are allotted by the national or regional industrial property office that publishes the patent document." Summary, supra note 178.