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PATENTS AND DEVELOPMENT: EXCLUSIONS, INDUSTRIAL APPLICATION AND TECHNICAL EFFECT

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Open Forum on the Draft Substantive Patent Treaty
Geneva, 1-3 March 2006

Article 12
Conditions of Patentability

(1) [*Subject Matter Eligible for Protection*] (a) A claimed invention shall fall within the scope of subject matter eligible for protection. Subject matter eligible for protection shall include products and processes [, in all fields of technology,] which can be made and used in any field of activity.
(b) Notwithstanding subparagraph (a), the following shall not be considered as subject matter eligible for protection:

(i) mere discoveries;
(ii) abstract ideas as such;
(iii) scientific and mathematical theories and laws of nature as such;
(iv) purely aesthetic creations.

…….

(4) [*Industrial Applicability/Utility*] A claimed invention shall be industrially applicable (useful). It shall be considered industrially applicable (useful) if it

[Alternative A]
can be made or used for exploitation in any field of [commercial] [economic] activity.

[Alternative B]
can be made or used in any kind of industry. "Industry" shall be understood in its broadest sense, as in the Paris Convention.

[Alternative C]
has a specific, substantial and credible utility.

(5) [*Exceptions*] Notwithstanding paragraphs (1) to (4), a Contracting Party may[, in accordance with the Regulations,] exclude certain inventions from patentability.

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Introduction

It has never been the case that "anything under the sun made by man" is patentable. Whether for good or bad reasons, not all original ideas with potential or real commercial applications, whether achieved through inspiration or perspiration, can be protected. Many are filtered out, either on a case-by-case basis or collectively. This is done in various ways. The novelty, inventive step and *industrial applicability* requirements are set at certain levels so that "inventions" falling short are not protected. In some jurisdictions, the statutes or the courts may define or interpret "invention" in ways that exclude certain classes of original idea such that they are not considered to be inventions at all and are therefore automatically ineligible. Alternatively, or in addition, certain subject matters are excluded. Thus, Europe excludes methods for treatment of the human or animal body by surgery or therapy and diagnostic methods practised on the human or animal body in Europe for their lack of *industrial applicability*. But often, subject matter *exclusions* exist not because inventive activity, at least in the patent law sense, is considered impossible, but because policymakers decide or are persuaded that to include such subjects is bad policy. Thus foods and medicines were excluded in many European and some other countries until quite recently.

Another filtering device is to add requirements to the "classic" three (i.e. novelty, inventive step and *industrial applicability*). Thus, in Europe inventions must also be of "technical character"[1] and hopefully exhibit some kind of "*technical effect*", which supposedly, albeit not always satisfactorily, excludes certain intellectual attainments from being classed as inventions.[2] Finally, inventions "the publication or exploitation of which would be contrary to ordre public or morality" are excluded. Here, the *exclusion* is applied on a case by case basis rather than to classes of invention.

This paper provides historical evidence in support of its claim that the Substantive Patent Law Treaty must safeguard the freedom of each country to adopt filtering devices of its own choosing and to the extent deemed necessary to best pursue its development or other socio-economic objectives. The United States and Europe have always enjoyed such freedom and so should the rest of the world. At the same time, it must be emphasised that neither jurisdiction provides a model for other countries to follow. Each country must find its own way and the SPLT must allow this. If not it is likely to harm their present economic interests and future development opportunities.

The rest of this paper consists of four parts. The first explains what development means, and shows how diverse developing countries are. This is important since countries' patent-related interests will inevitably vary. Some may consider this part unnecessary. But "development" is more often uttered than properly understood. The second discusses

[1] Thereby excluding aesthetic creations and presentations of information, unless they have new "technical features".

[2] Lack of technical effect may not be decisive but in the case of discoveries "If a new property of a known material or article is found out, that is mere discovery and unpatentable because discovery as such has no technical effect and is therefore not an invention within the meaning of Art. 52(1). If, however, that property is put to practical use, then this constitutes an invention which may be patentable."

what developing countries should expect from an effective patent system in terms of stimulating and diffusing innovation throughout the economy while meeting the needs of consumers. Many critics of recent trends in international IP rulemaking tend understandably to focus on the deleterious effects of IP. This paper differs in that its analysis is based on a case of a successful national patent system. The third part presents this case study. The fourth and final part presents the lessons of this case study and more general discussion in the paper for the consideration of WIPO member states negotiating the SPLT, and especially the provisions concerning *exclusions*.

1. Development and Diversity

"Development", a word borrowed from biology, is a term whose meaning is contested by social scientists and international development experts and organisations. Nowadays, it is common to speak of "economic development", which focuses on a country's measurable economic performance relative to other countries; of "human development", which supplements economic development by incorporating social welfare considerations; and of "sustainable development", which takes into account the environment as well.

Conventionally, the extent of a country's development is quantified by using certain indicators of income and output, such as gross national product (GNP). This is of course *economic* development. At its crudest, the economic progress of different countries is compared by making country league tables, with the richest nations according to GNP per capita at the top and the poorest with the lowest figures propping up the table at the bottom. The World Bank's annual World Development Reports rank countries in this way (although the reports provide various other indicators of development as well).[3] Thus, the World Bank uses GNP per capita to divide the world into four types of country: low income economies, lower middle income economies, upper middle income economies and high income economies.

More commonly, though, we tend to talk of developed countries and developing countries as if there are no other kinds of country. Alternatively, but similarly, following the 1980 report of the Independent Commission on International Development Issues chaired by Willi Brandt, the developed world is "the North" and the developing world is "the South".[4] In 1971, though, the United Nations carved out a sub-category of the latter grouping, the "least developed countries" (LDCs). LDCs receive preferential treatment in terms of development finance, trade and technical assistance. More than half of these countries are in Africa.

Even with the addition of the LDCs, this is rather simplistic and fails utterly to reflect the sheer diversity of the world, which is extreme even if we confine our analysis to those countries that are poor compared to Western Europe, North America, parts of East Asia and Australasia. Indeed, at the opposite end of the developing world spectrum from the LDCs, and far far away in terms of income levels and living standards, are the vastly

[3] For synopses on present and past World Development Reports, see http://econ.worldbank.org.
[4] Brandt, W. (1980) *North-South: A Programme for Survival*. London: Pan.

different newly industrialising economies, which have attained a level of economic development that is very close to that of developed countries and, rather illogically, exceeds some of them. There are also the transition economies consisting of the former communist countries that are converting to market economies but are not wealthy enough yet to be classed as developed countries.

GNP per capita paints a very incomplete, not to say misleading, picture of the actual conditions and capabilities of individual people in a country. As Amartya Sen explains, “there is every evidence that even with relatively low income, a country that guarantees health care and education to all can actually achieve remarkable results in terms of the length and quality of life of the entire population”.[5] In order to make the concept of development more people oriented, the United Nations Development Programme, influenced by the work of Sen, adopted the term “human development”. The UNDP human development index, which was devised by Mahbub ul Haq, and is updated every year in the organisation’s Human Development Reports, ranks countries by their performance in terms of life expectancy, literacy, education and gross domestic product.[6]

The concept of “sustainable development” has its origins in the 1980 World Conservation Strategy of the International Union for the Conservation of Nature and Natural Resources.[7] Sustainable development was seen as a normative process in which conservation and development are combined to improve human welfare while practicing what the Strategy refers to as “living resource conservation”.

According to the 1987 World Commission on Environment and Development, chaired by Gro Harlem Brundtland, sustainable development is “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”.[8] Sustainable development embodies two key notions:

- the concept of “needs”, in particular the essential needs of the world’s poor, to which overriding priority should be given; and
- the idea of limitations imposed by the state of technology and social organization on the environment’s ability to meet present and future needs.

At the 1992 United Nations Conference on Environment and Development (the “Earth Summit”) in Rio de Janeiro, the international community embraced the concept of sustainable development when it adopted Agenda 21, a programme to promote sustainable and environmentally sound development from then and into the twenty-first century, and the Rio Declaration on Environment and Development.

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[5] Sen, A. (1999) *Development as Freedom*. Oxford: OUP, at 144.
[6] To download present and past Reports, visit the UNDP-HDRO website: http://hdr.undp.org/
[7] IUCN, UNEP & WWF (1980) *World Conservation Strategy: Living Resource Conservation for Sustainable Development*. Gland: IUCN.
[8] World Commission on Environment and Development (1987) *Our Common Future*. Oxford: OUP, at 43.

In 2000, the United Nations Millennium Summit was held at which UN member states agreed on a set of goals and targets for achieving development. The eight goals are now known as the Millennium Development Goals (MDGs), and are as follows:

1. Eradicate extreme poverty and hunger
2. Achieve universal primary education
3. Promote gender equality and empower women
4. Reduce child mortality
5. Improve maternal health
6. Combat HIV/AIDS, malaria and other diseases
7. Ensure environmental sustainability
8. Develop a global partnership for development

The version of development that best captures the intent of the MDGs appears to be sustainable development.

2. Innovation, Patents and their Roles in Development

Innovation is not necessarily lacking in developing countries. However, harnessing innovation to generate wealth is a huge challenge for many of them. Of course, some developing countries are already quite advanced in science, technology and industrial development and are well placed to exploit the creativity of their populaces. The majority of countries, though, still have a long way to go indeed.

Enhancing the applied scientific and technological bases of developing countries requires appropriate regulatory and legal frameworks providing rewards and incentives for innovation and investment. For them to transform their comparative advantage from producing low-value commodities to high-value goods and services while increasing employment possibilities for the poor, developing countries need to identify technological fields or industrial or market sectors where they may be able to compete internationally, and to acquire and/or channel the necessary investments to develop and market high value products. While science-based research-intensive industries and technologies like information and communications technologies, pharmaceuticals and the new biotechnologies are extremely important, competitive high value-added products can be developed without cutting-edge scientific knowledge and equipment. High-value products may succeed in the market based on knowledge acquired from a range of local sources including traditional communities, which often have to be creative just to survive. Products will command high prices in international markets only if they are knowledge-intensive, but this does not by definition require them to be science-based, high-tech or R&D intensive. In fact, various kinds of knowledge must be acquired and used for *any* product to succeed in the increasingly competitive global economy. These need not be science and technology-related at all. According to Mytelka and Tesfachew,[9] these kinds of knowledge include:

[9] Mytelka, L. K. & Tesfachew, T**.** (1998) *The Role of Policy in Promoting Enterprise Learning During Early Industrialization: Lessons for African Countries*. Geneva: UNCTAD, at 2..

- product design
- process engineering
- quality control
- management and maintenance routines
- knowledge about markets and investment opportunities
- skills and capabilities needed to undertake changes in products and processes, create networks, and sustain partnering activity.

In sum, innovation is a complex process intertwined with factors such as the strength of the knowledge base, institutional arrangements, qualifications of the labour force, openness of the economy and an overall ability to take on board improvements achieved in other countries or sectors.[10]

Innovation connotes newness but it is possible to argue that an innovation for one company or national economy may not necessarily be innovative to another. Ernst et al[11] make this point when they define "innovation" as "the process by which firms master and implement the design and production of goods and services that are new to them, *irrespective of whether or not they are new to their competitors – domestic or foreign*".[12]

Although this definition has the weakness of blurring the distinction between innovation and imitation, it does at least make clear that promoting innovation in developing countries also means facilitating the acquisition, dissemination, and (where necessary) adaptation of knowledge and technologies from elsewhere.

While it is the private sector that will be most involved in external trade, governments have a vital role to play in capacity building and in creating a conducive institutional and regulatory environment to promote innovation from basic research to commercialisation. Indeed, it is widely accepted among policymakers that governments, the private sector and other stakeholders need to cooperate in order to promote, diffuse and exploit technological innovation for the benefit of the national economy.

A very important question arises, which is that of whether learning to innovate requires freedom to imitate. A related question is: can imitation itself be creative? Dealing with the former question first, there is ample historical evidence to suggest that learning to innovate does indeed require such freedom.[13] Over the years, Royal Philips Electronics has been responsible for an impressive series of breakthrough inventions, such as

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[10] Dutfield, G. & Suthersanen, U. (2004) "The innovation dilemma: intellectual property and the historical legacy of cumulative creativity". *Intellectual Property Quarterly* 4, 379; Lee, Y. & Langley, M. (2004) "Invention and innovation". CIPA Journal 464.

[11] Ernst, D., Mytelka, L. K. & Ganiatsos, T. (1998) "Technological capabilities in the context of export-led growth: a conceptual framework", in D. Ernst, T. Ganiatsos & L. K. Mytelka (eds.) *Technological Dynamism and Export Success in Asia*. London: Routledge. Pp. 5-45. Cited in Mytelka & Tesfachew *op cit.*, 1-2.

[12] Emphasis added.

[13] Dutfield, G. (2004) "Trade, development and the international patent regime: does one size fit all?" *Harvard International Review* 26(2), 50-4.

compact audio cassettes and compact discs. What is less well-known is that the company was set up in 1891 to commercially exploit somebody else's invention, Thomas Edison's and Joseph Swan's carbon filament lamp. Commercial success generated considerable revenues that enabled the firm to produce its own inventions and eventually become one of the world's most innovative corporations. How was Philips able to get such a good head start? From 1869 until 1912, Holland had no patent law. This meant that local entrepreneurs could copy foreign inventions and put them to work for their own profit, at least as long as they could figure out how they worked.

The well-known Swedish mobile phone company, Ericsson, was formed in 1876, the same year as Alexander Graham Bell made his first phone call. Sent some of these new devices to repair, the company worked out how to make them, and by 1878 was selling its own phones to the Swedish public. Bell had neglected to file patents on his invention in Sweden and the rest is business history.

In 1960, Texas Instruments filed a patent in Japan on the integrated circuit, arguably one of the most important inventions of the second half of the twentieth century. The Japan Patent Office allowed itself 29 years to grant the patent. By that time Japanese companies, free to read the patent specification 18 months after filing, acquired the technology, improved upon it, and controlled 80 percent of the US market for computer semiconductors.[14] Again, in a world of highly varied national patent laws – or no law at all in one example – one country's invention was also another country's economic gain.

Setting to one side the rights and wrongs of such "borrowings", and one should add here that many other examples could be given, the point is that such behaviour broke no international rules of the day. Furthermore, freedom to use such technologies was often beneficial not only to the imitator companies but also to the national economies in which they were based. Indeed, none of the recipient countries remained copiers for long; eventually they became among the world's most technologically advanced.

If we turn to the second question, free-riding or imitation can be creative in itself. Indeed, it may even be necessary, albeit within reasonable limits. According to Kim and Nelson, "imitation ranges from illegal duplicates of popular products to truly creative new products that are merely inspired by a pioneering brand".[15] Distinct imitations may include "knockoffs or clones, design copies, creative adaptations, technological leapfrogging, and adaptation to another industry".[16] One should not take this argument too far, though. Copying CDs and misappropriating trade marks provides no scope for learning at all. Moreover, if it is too easy to profit from uncreative imitation, there is unlikely to be much incentive to innovate.

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[14] Johnson, C. (1995) *Japan: Who Governs? The Rise of the Developmental State*, W.W. Norton & Co.. New York & London, 74-5.

[15] Kim, L. and Nelson, R.R. (2000) "Introduction", in L. Kim and R.R. Nelson (eds.) *Technology, Learning, and Innovation: Experiences of Newly Industrializing Economies*. Cambridge: Cambridge University Press.

[16] Kim and Nelson op cit, citing Schnaar, S. (1994) *Managing Imitation Strategy: How Later Entrants Seize Markets from Pioneers*. New York: Free Press.

This discussion raises an important policy question: to what extent should new innovations *not* be protected as intellectual property?[17] Or if they are, how far should the rights be limited so that local producers can learn how to innovate? This paper deals with the first question, leaving the second to others. However, my contention is that different countries are bound to have varying answers to these questions, in part due to their disparate levels of development. Unfortunately, sound evidence-based answers are hard to come by. But in the meantime, it would be unwise to hold all WIPO members to identical definitions of novelty, inventive step and *industrial applic*ability.

3. The German Patent Law of 1877 and the Synthetic Dyestuff Industry

3.1 Synthetic dyestuffs and international trade

The synthetic coal-tar based dyestuff industry began in Britain and France in the late 1850s.[18] In the early years, Britain and France were the global leaders in terms of innovation and production, a situation that was expected to continue for the foreseeable future. However, in the following decades, dominance was achieved by two countries, Germany and Switzerland, that made determined efforts to catch up with and overtake Britain and France, whose early discoveries they depended on to get started. Consequently, in 1899, the value of dyes produced by Germany was more than ten times that of either country. Switzerland's output was about double that of Britain and France.[19] By 1913, German companies had captured 85 per cent of the global market for dyestuffs. Switzerland, the only other major exporter was in second place with 10 percent. This situation is noteworthy for a number of reasons. First, like today's developing countries, Germany and Switzerland were striving to catch up with more economically and technologically advanced countries. Second, these countries were able to take advantage of weak domestic patent systems and strong foreign ones to protect their infant industries, dominate foreign markets, and transform their dyestuff businesses from being imitators to innovators.

The aniline dyes were the first generation of the coal tar dyes. The second generation of synthetic dyes were the azos. The first ones, Manchester Yellow and Manchester Brown, were discovered in 1864 by two German chemists working at the time for British firms, Heinrich Caro and Carl Martius. Within 40 years, more than 50 percent of the

[17] A related question falling beyond the scope of this paper is: how far should legal protection extend to inventions that may just fall short of the conventional standards of inventiveness required by the patent system. Should we just set them free? Should we lower patentability thresholds? Or ought we to offer alternative intellectual property regimes to patents for these inventions, such as utility models? See Suthersanen, U., Dutfield, G. & K.B. Chow (eds) *Innovation Without Patents: Harnessing the Creative Spirit in a Diverse World,* Cheltenham: Edward Elgar (in press).
[18] For a details account of the emergence of this industry and the 1877 German patent law, see Dutfield, G. (2003) *Intellectual Property Rights and the Life Science Industries: A Twentieth Century History*. Aldershot: Ashgate.
[19] Schiff, E. (1971) *Industrialization without Patents: The Netherlands, 1869-1912, Switzerland, 1850-1907*. Princeton: Princeton University Press, at 100.

commercial dye products were azos.[20] The third generation of synthetic dyes appeared in 1869 with the synthesis of the natural dye, alizarin, based on a formula devised by two German academic scientists, Carl Graebe and Carl Liebermann. After they patented their discovery a race began to find a way to produce it on a commercial scale. Caro, who had moved to the new German firm BASF, developed a promising process and filed a patent jointly with Graebe and Liebermann in Britain just one day before their British rival William Perkin, who had come up with a very similar process. The fourth stage in the evolution of the synthetic dyestuff industry arrived with the manufacture and successful commercialisation of synthetic indigo. This achievement was especially important. It required an unprecedented commitment to in-house research and development. More specifically, it stimulated the development of the twentieth-century fine chemical and pharmaceutical industries.[21]

The French dyestuff industry dominated the aniline phase, while the early part of the azo phase marked the leadership of the British firms.[22] So by the mid-1860s Britain was pre-eminent with France in second place. There did not appear to be any serious rivals at the time, but from the beginning of the alizarin phase, the German industry rapidly achieved almost absolute dominance.

3.2 The first German patent law

The development of German patent law in the late nineteenth century was very much driven by interest groups. The *Deutsche Chemische Gessellschaft* strongly favoured a patent law and sought to convince Chancellor Bismarck of the need for such legislation. Without a country-wide patent system barriers to entry were low, enabling many new chemical firms to spring up in the early 1870s. But, with the economic recession that began in 1873, many small firms went bankrupt and the chemical industry consolidated so that the market became dominated by a few large firms. Many of these surviving businesses saw a need for a patent law to protect their innovations.[23] So in 1874 a group of high-technology firms jointly set up a pressure group, *Deutsche Patentschutz-Verein*, to lobby for a patent law that would benefit German industry. It was headed by industrialists and scientists representing different industries including engineering and synthetic dyestuffs.

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[20] Haber, L.F. (1958) *The Chemical Industry during the Nineteenth Century: A Study of the Economic Aspect of Applied Chemistry in Europe and North America*. Oxford: Clarendon Press, at 83.

[21] As Arthur Green so presciently commented in 1901, "the manufacture of synthetic medicinal agents, artificial perfumes, sweetening materials, antitoxines, nutritives, and photographic developers are all outgrowths of the coal-tar industry, and in great part still remain attached to the colour works where they originated. Of these subsidiary industries the most important is the manufacture of synthetic medicinal preparations, which has already attained to large proportions, and bids fair to revolutionise medical science." Green, A.G. (1915 [1901]) "The relative progress of the coal-tar colour industry in England and Germany during the past fifteen years", in W.M. Gardner (ed.), *The British Coal-Tar Industry: Its Origin, Development and Decline*. London: Williams and Norgate, at 190.

[22] Bensaude-Vincent, B., and I. Stengers (1996) *A History of Chemistry*. Cambridge and London: Harvard University Press, at 183.

[23] Johnson *op cit.*, at 175.

Within German industry as a whole there were a number of conflicting views. While the engineers' association lobbied in favour of a patent law, there were still differences about the kind of patent law needed. Werner Siemens, then one of the most powerful industrialists, was gravely concerned that rival British and American firms would take out many patents for inventions that they would not work in Germany, and which would severely restrict the research and commercial opportunities of German companies.[24]

The chemical industry was also divided. Some firms (for example, BASF) favoured a patent law which protected processes but not products, and were thus unhappy that the first draft of the patent law would have provided protection of chemical products as such. They argued that this created no incentive to improve production processes.[25] On the other hand, Adolf Brüning, a founder of Hoechst,[26] wanted the chemical industry to be completely excluded from the patent system.[27] His believed the French and British chemical industries had been harmed because the laws there had allowed excessively strong monopoly protection for intermediate products, whereas – as he saw it – the lack of a German patent law had enabled the chemical industry to expand. Although the synthetic dyestuff firms had not completely reached a consensus, the board of the *Gessellschaft* submitted a petition to the Reichstag which argued in favour of patents for methods of manufacturing chemical products but not the products themselves. The stated grounds were that "a chemical product can be obtained by various methods and from different starting materials; the grant of a patent for the product itself would prevent better processes discovered subsequently from being brought into effect in the interest of the public and of the inventors".[28] In the event, the *Gessellschaft*'s position was heeded and adopted by virtue of Section 1 of the 1877 Patent Law, according to which

> Patents are granted for new inventions which permit of an industrial realization. The exceptions are: … 2. Inventions of articles of food, drinks and medicine as well as of substances manufactured by a chemical process in so far as the inventions do not relate to a certain process for manufacturing such articles.

The language is somewhat vague, but implies that while processes alone could be patented, chemical products could only be protected if manufactured by a specific process and by no other. Since the interpretation of the courts (until 1888) was that sale of a chemical made through a patented process did not constitute infringement,[29] chemical products were effectively excluded. While this provision encouraged chemists to be creative and devise original processes, it also encouraged anti-competitive

[24] Kronstein, H., and I. Till (1947) "A reevaluation of the international patent convention". *Law and Contemporary Problems* 12: 765-81, at 773-4.
[25] Johnson *op cit.*, 175.
[26] Then known as Meister, Lucius & Brüning.
[27] Kronstein and Till *op cit.*, 774.
[28] Bercovitz-Rodriguez, A. (1990) "Historical trends in protection of technology in developed countries and their relevance for developing countries". Geneva: United Nations Conference on Trade and Development, at 6.
[29] Grubb, P.W. (1999) *Patents for Chemicals, Pharmaceuticals and Biotechnology*. Oxford: Clarendon Press, at 23.

"blocking patents" intended to close off broad areas of research from competitors.[30] Another noteworthy provision, which also appears to have reflected the interests of many German firms, was Section 11, according to which a patent could be withdrawn after three years, either

> if the patentee neglects to work his invention in the Country to an adequate extent or to do all that was requisite for securing the said working; [or] when it appears conducive to *the public interest* that permission to use the invention be granted to others and the patentee refuses to grant such permission for a suitable compensation and on good security.

Finally, in common with many countries today, it was possible to except inventions deemed contrary to public order or morality. And not only chemical products were unpatentable; inventions regarding luxuries, medicines and articles of food could also not be protected.

Most historians of the European synthetic dyestuff industries with a view on the matter[31] agree that the 1877 patent law had a positive effect overall, encouraging the establishment of research and development departments in all the major firms. The availability of protection for chemical processes but not products reflected the prevalent commercial and research strategies of the German firms at that time. They soon realised that chemical dyes were not only products, but were also likely to be intermediates for other products. Therefore patenting dyes directly could have inhibited the kinds of innovation that allowed German firms to compete with their British counterparts. Process innovation was all-important for them because, whereas British firms with the advantage of a huge market for textiles were mostly interested in creating as many new products as possible, the concern of German firms was to develop processes enabling them to improve efficiency and cut costs while also meeting the requirements of the dyers for the widest possible range of colours for all fabrics. But they soon found they could achieve cost efficiencies best by putting on the market a massive range of colours for all fabrics, using the same production equipment to create them. Emphasising process innovation as a research strategy and product diversity as a marketing strategy resulted in the cost-effective generation of an extraordinarily large range of new and relatively inexpensive products. By 1914, Bayer had 2,000 different dyestuffs[32] while Hoechst made as many as 10,000.[33] The development of such huge product portfolios gave the big three German firms, Bayer, BASF and Hoechst "a firm grip on every conceivable composition of hydrocarbons, firmly shielded by a wall of patents and tacit knowledge".[34]

[30] Haber *op cit.*, at 203.
[31] For example, Homburg *op cit.*, at 110; Johnson *op cit.*, at 176.
[32] Wengenroth, U. (1997) "Germany: competition abroad - cooperation at home, 1870-1900", in A.D. Chandler, F. Amatori & T. Hikino (eds), *Big Business and the Wealth of Nations*. Cambridge: Cambridge University Press, at 143.
[33] Murmann and Landau *op cit.*, at 31.
[34] Wengenroth *op cit.*, at 144 (emphasis added).

On the other hand, the development of the azo dyes rendered inadequate, from the position of industry, the German patent law's provisions concerning chemical processes. Let us look at the difficulties that arose and see how the regulatory system responded.

First, there is a danger that broad patent protection can stifle innovation in new industries where the learning curve is particularly steep. The dyestuff industry was a case in point. During its infancy, some of the most innovative activity centred on *existing* chemical substances. This was, first, because compounds may have many uses that would have been inconceivable to their original discoverer or manufacturer.[35] For example, research on some of the dyestuffs revealed that they also had pharmaceutical properties. Second, it was likely that ways would soon be found to manufacture the substance in a more efficient and cost-effective way than its original inventor had managed to do. Third, the substance might have turned out to be an intermediate for the manufacture of a large number of other useful substances which individually could have required minimal additional effort, expense or inventiveness to discover. For these three reasons, allowing chemical substances to be patented may have fatally discouraged innovation by allowing excessively strong monopolies. This explains why the German chemical industry lobbied against product patents on chemicals in the 1870s. That this situation has changed in more recent times explains why the trend in Europe since the Second World War has been to allow patents for chemical products.

The second major difficulty, and this is particularly relevant to the azo dyes, is that a whole family of compounds may share the same useful characteristic. Thus, the application of a chemical process may generate large numbers of related substances producing the same effect. How broadly should patent applicants be allowed to extend their claims? Should it be allowable only to patent a process for one and only one substance? Or should it be possible to go to the other extreme, casting the net as widely as possible to claim as many classes of related substances as is theoretically conceivable "besides the substances actually used in the 'invented' process"?[36] The dilemma is that protection could be so inadequate as to be worthless, or so strong as to inhibit innovation.

The third problem is that the patent doctrines of the period had been formulated with mechanical inventions in mind and not chemical processes. Therefore, difficulties were bound to appear. In the case of azo dyes, an important issue that soon arose was that of whether or to what extent it should be considered inventive to apply a known process to manufacture a new dye. The problem was not resolved until an 1889 Supreme Court case relating to the Congo Red dye. The outcome was the fashioning by the court of "the new *technical effect*" doctrine, which softened the requirement of true inventiveness in certain cases where the result was a product with "unexpected and valuable technical qualities". According to one account:

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[35] The same might be said for genes, whose patenting is controversial today (see Dutfield, G. (2003) *Intellectual Property Rights and the Life-science Industries: A Twentieth Century History*. Aldershot: Ashgate).

[36] Belt, H. van den, & Rip, A. (1989) "The Nelson-Winter-Dosi model and synthetic dye chemistry", in W.E. Bijker, T.P. Hughes & T. Pinch (eds), *The Social Construction of Technological Systems*. Cambridge: MIT Press, at 152.

> The court argued that the process for making Congo red, lacking any inventiveness of its own, would as such not have been patentable. In this case, however, the application of the general method resulted in a dyestuff of undoubted technical and commercial value. Its unexpected and valuable technical qualities more than compensated for the lack of inventiveness of the process. In other words, the court said that, if the requirement of utility is particularly emphasized, it is no longer necessary to look at whether the requirement of inventiveness is also satisfied.[37]

The court's decision had great long-term importance. For one thing, it enabled the bigger firms to amass large patent holdings for inventions based on their organised large-scale research programmes. In consequence, it became economically more feasible for chemical firms to invest in organised large scale in-house research and development. This provided long-term economic benefits for Germany.

In 1891, the German patent law was reformed to incorporate the new *technical effect* doctrine and statutorily recognise another Supreme Court decision in 1888 that sale of a chemical made through a patented process infringed the patent. The latter change benefited the German chemical industry by preventing Swiss firms from exporting such chemicals to Germany. The prohibition on the patenting of chemical substances as such remained. This was in accordance with the demands of industry, which held that "such comprehensive protection has ... always been considered by the German chemical industry as an obstacle prejudicial to the discovery of new and improved processes".[38]

Finally, it is worth mentioning here that the German companies' attempts to use patents to exclude competitors in foreign markets were assisted greatly if they could acquire protection of chemical substances in those places, and not just of processes. So their control was particularly strong in Britain and the USA, where both kinds of protection were available. A 1912 US Tariff Board study found that as many as "98 per cent of applications for patents in the chemical field had been assigned to German firms and were never worked in the United States".[39]

3.3 Some implications of the German case for patent law harmonisation

It is difficult to dispute the evidence that the 1877 German patent law worked very well in terms of stimulating innovation and the production and availability of new products. It was a carefully drawn up piece of legislation that reflected the interests of key emerging industrial sectors. It is unclear whether the general public had any say at all. And yet, it contained a number of safeguards that attempted to reflect the interests and perspectives of the public. It also sought to promote industrial development in ways that did not always appear just to address the needs of the most politically active business sectors. It is interesting also that the origins of the technical character idea and the new *technical*

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[37] Ibid., at 154.
[38] Quoted in Bercovitz-Rodriguez *op cit.*, at 6.
[39] Noble, D.F. (1977) *America by Design: Science, Technology, and the Rise of Corporate Capitalism*. New York: Alfred A. Knopf, at 16.

effect doctrine are rooted in the era of rapid European industrialisation and the shift from the age of the individual entrepreneur-inventor to that of innovation driven by transnational corporations competing on the basis of having large expensive in-house research and development structures. The same may be said for the origins of the related concept of *industrial application* (or "realisation").[40] The genesis of the *technical effect* doctrine is of special interest in that it operated as a device to facilitate patenting in an industry that was producing huge volumes of products that evidenced very little genuine inventiveness. In essence it was a solution to a particular problem at a particular time. And yet the alleged absence of a *technical effect* is a major reason why software programs as such are not regarded as inventions in the European Patent Convention (even though they are still patentable!). Is this just an intriguing historical irony or does it also reflect incoherent thinking on the part of the powers that be?

One may of course reasonably wonder why so much weight is given in this paper to events taking place in one European country nearly 130 years ago when the present matter concerns a draft international patent harmonisation treaty. Nonetheless, the case discussed leads us to some highly relevant inferences. Here are a few:

1) In the past "catch up" countries were able to take advantage of patent law differentiation by preventing foreign companies from dominating national markets while using the wider availability of patent rights in "leader" countries to gain substantial market shares.
2) Well designed patent systems *can* benefit national economies just as poorly designed ones can harm them.
3) Patent policymaking is a matter for *national* decision making involving the collaboration of all *national* stakeholders including owners, users and the public. Foreign interests should not be ignored but government business regulation is about what is good for the national economy and the country's citizens. Good policymaking cannot be based solely on the implementation of obligations accepted in multilateral treaties or regional or bilateral trade agreements. Unfortunately, policymaking often seems to be done in this way, which is to say that policy*taking* is the norm rather than policy*making*.
4) As the Congo Red case suggests, each country must be able to formulate its own IP (and other) regulatory solutions to its own problems. Countries and regional jurisdictions should be cautious about importing solutions from elsewhere or transferring them to contexts in which they are inappropriate or might otherwise just not work. Policy should be better informed and more evidence-based than this.

[40] For discussion on the relationship between industrial application and technicality, see Schar, M. (1999) "What is technical? A contribution to the concept of 'technicality' in the light of the European Patent Convention". *Journal of World Intellectual Property* 2(1), 93-129.

4. Exclusions, National Interests and the Substantive Patent Law Treaty

Legal harmonisation, including identical rules and agreed definitions of terms[41] and scope of interpretation,[42] benefits leader nations not those seeking to catch up. The latter countries are unlikely to favour legal harmonisation, unless perhaps doing so helps them preserve their relative advancement compared to those behind them. The same is likely to apply to international patent rulemaking.

As with all economic law reforms, we can expect some to gain and others to lose from patent law harmonisation. But by how much? Static gains and losses are calculable, dynamic ones are far far harder to estimate. But irrespective of whether the gains for the gainers of harmonisation are sufficient to compensate the losers for their losses, such a calculus of economic efficiency (i.e. Kaldor-Hicks efficiency)[43] is moot. The gainers will not compensate the losers.

It is absolutely vital that Article 12(5), "a Contracting Party may … exclude certain inventions from patentability", be maintained. However, this paper does not presume to propose specific *exclusions* that different developing countries should provide for themselves and defend in the SPLT. Neither does it suggest any other way to filter out the "stuff" they do not want the patent system to protect. This is for each of these countries to decide according to their own interests including those of domestic IP owners, users and the public, just as Germany did in the 1870s to that country's great advantage. They should be able to make sincere attempts to do this freely and without being stigmatised as pirate nations, thieves and, in the case of Brazil, China and India, members of the "axis of IP evil". What is being argued is that agreeing *internationally* on rules and definitions and interpretations of key terms and concepts that unduly constrain developing countries' room for manoeuvre is a dangerous path for them to follow. Like charity, good patent policymaking begins at home.

In this context and in closing this paper, the most important provision in the draft SPLT would appear to be the bracketed Article 2(3), especially the second part:

> *Public Interest Exceptions* Nothing in this Treaty and the Regulations shall limit the freedom of a Contracting Party to protect public health, nutrition and the environment or to take any action it deems necessary to promote the public interest in sectors of vital importance to its socio-economic, scientific and technological development.

Since intellectual property rights exist primarily to further the public interest, this provision must surely be part of the final text. There is no justification whatsoever for opposing it. After all, if patent law does *not* "promote the public interest in sectors of

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[41] Such as novelty, inventive step and industrial application.
[42] Such as of the research/experimental use exemption.
[43] "Using Kaldor-Hicks efficiency, a more efficient outcome can leave some people worse off. Thus, an outcome is more efficient if those that are made better off could *in theory* compensate those that are made worse off …" http://en.wikipedia.org/wiki/Kaldor-Hicks_efficiency, visited 16 February 2006.

vital importance to its socio-economic, scientific and technological development", then what is it for?