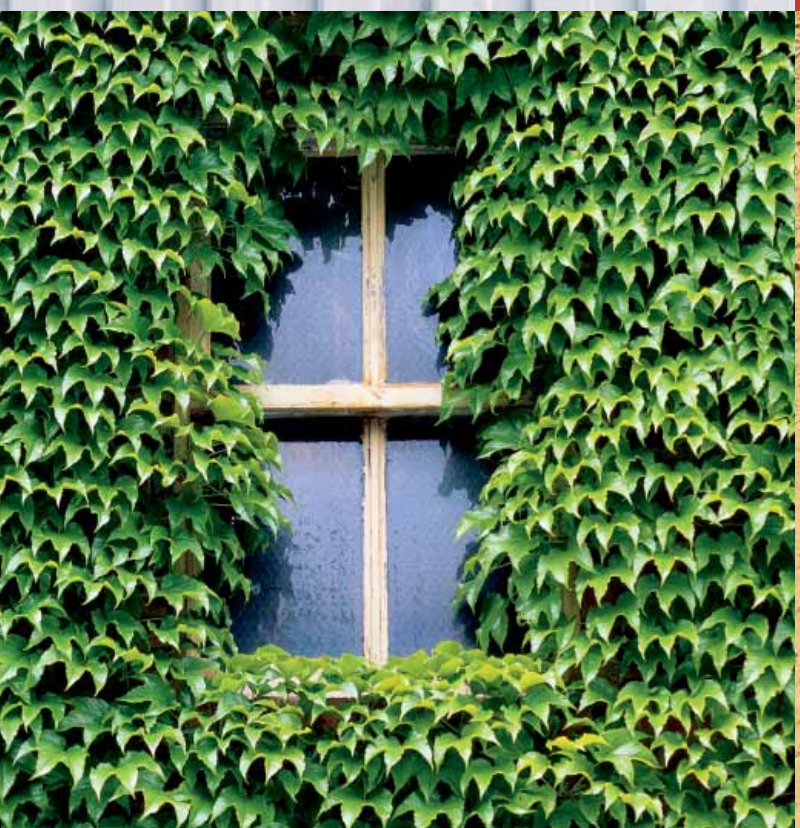
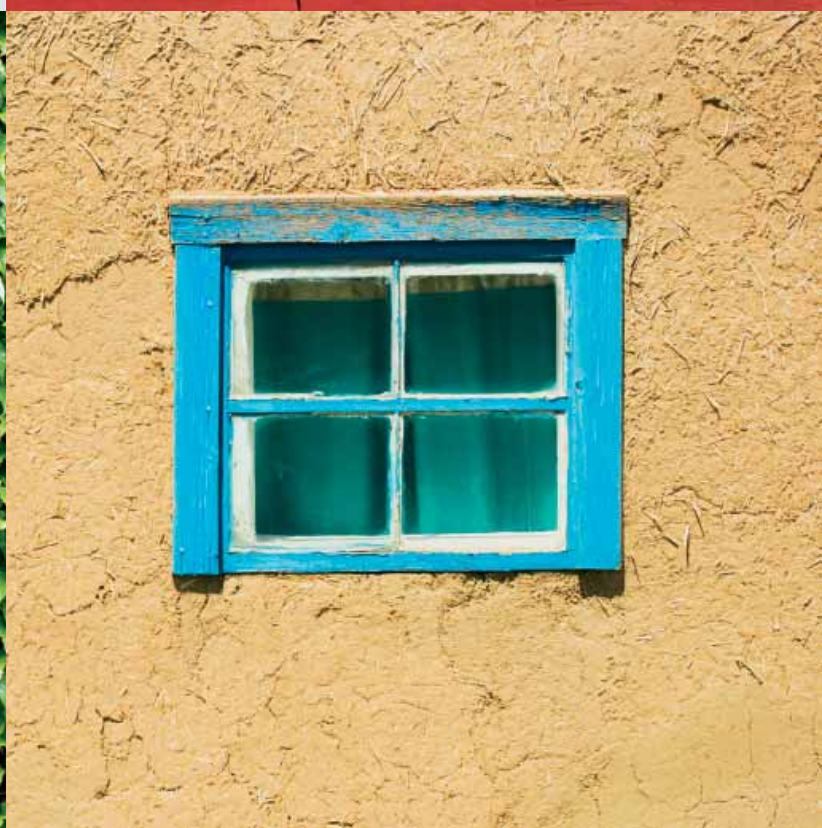
Europäisches Patentamt
European Patent Office
Office européen des brevets

SCENARIOS FOR THE FUTURE

How might IP regimes evolve by 2025? What global legitimacy might such regimes have?



The European Patent Organisation was established by the Convention on the Grant of European Patents (EPC) which was signed in Munich in 1973. The European Patent Organisation has two organs: the European Patent Office (EPO) – its executive body – and the Administrative Council, which for most intents and purposes is its legislative body. For the fundamental issue of actually revising the EPC, however, that role is assumed by an intergovernmental diplomatic conference of the contracting states.

The EPO is the outcome of the European countries' collective political determination to establish a uniform patent system in Europe. This centralised patent-granting system, administered by the EPO on behalf of the member states, is an exemplary model of successful co-operation in Europe.

The EPO is one of the largest intellectual-property organisations in Europe and indeed the world – a financially and administratively independent European public-service organisation with its seat in Munich, and offices in The Hague, Berlin, Vienna and Brussels. Its annual budget is well over €1,000 million. In 2006, it received more than 200,000 applications, granted close to 63,000 patents and had a staff of over 6,000. European patents are granted on the basis of harmonised law codified in the European Patent Convention (EPC) and laying down a single unified procedure for the now 32 member states of the European Patent Organisation.

The following states are currently members of the European Patent Organisation: Austria (AT), Belgium (BE), Bulgaria (BG), Switzerland (CH), Cyprus (CY), Czech Republic (CZ), Germany (DE), Denmark (DK), Estonia (EE), Spain (ES), Finland (FI), France (FR), United Kingdom (GB), Hellenic Republic (GR), Hungary (HU), Ireland (IE), Iceland (IS), Italy (IT), Liechtenstein (LI), Lithuania (LT), Luxembourg (LU), Latvia (LV), Monaco (MC), Malta (MT), Netherlands (NL), Poland (PL), Portugal (PT), Romania (RO), Sweden (SE), Slovenia (SI), Slovakia (SK), Turkey (TR).

The EPO is headed by its President (until 30 June 2007 Professor Alain Pompidou, from July 2007 Alison Brimelow). A number of smaller units report directly to the President; otherwise, the Office's organisational structure is as follows: DG 1 carries out prior-art searches, substantive examination and opposition; DG 2 is responsible for operational support; DG 3 rules on appeals against decisions taken during grant and opposition proceedings; DG 4 is responsible for finance, personnel, general administration, patent information and language services; and DG 5 is responsible for patent law, European and international affairs, patent- and non-patent-related legal issues, and the European Patent Academy.

The granting process at the EPO provides sound and cost-effective patent protection based on unitary standards in the contracting states (one application, one language, 'à la carte' market coverage through the 'designated state' system).

"And it ought to be remembered that there is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things. Because the innovator has for enemies all those who have done well under the old conditions, and lukewarm defenders in those who may do well under the new."
Niccolo Machiavelli, *The Prince*, 1532

Scenarios constitute plausible, relevant and challenging stories about possible future worlds. This set of four *EPO Scenarios for the Future* aims to provoke the reader and encourage strategic conversation amongst the wide range of stakeholders who populate these worlds. This document is therefore written in lay terms in order to reach this wide audience.

These four scenarios – *Market Rules* (business), *Whose Game?* (geo-political), *Trees of Knowledge* (societal) and *Blue Skies* (technological) – have been developed by the EPO scenario builders, but as far as possible they reflect the many and disparate perspectives encapsulated in the interviews which we undertook as part of the initial exploration phase. They do not represent the views of the EPO on the patent system or its future.

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SCENARIOS FOR THE FUTURE

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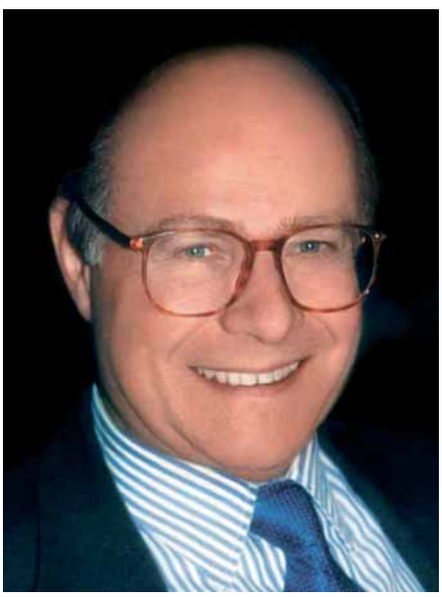
What global legitimacy might such regimes have?



Letter from the President
Professor Alain Pompidou

I wish to take this opportunity to commend this compendium to you, as the culmination of a three-year in-depth research project. It aims to look at how best we can rediscover and renew the basic principles underpinning our Organisation and its inherent purpose.

I would like to thank all of those many individuals, both beyond and within the EPO, who have freely given of their valuable time in contributing to this whole process, for their unstinting efforts and for sharing their ideas so openly with us.

Our exploration exercise involved over a hundred formal interviews which were conducted with leading experts from across the world, and from across a wide spectrum of disparate disciplines. We carefully selected a group of eminent and influential thinkers for interview from the world of business, civil society, administrators, policy-makers, IP associations, international organisations, patent offices, including the three Trilateral founders, the media and academic institutions. (Please refer to the list of contributors in the Acknowledgements section and on the enclosed CD-ROM). These interviews are personal statements and opinions about patenting and intellectual property as a whole and, as such, embody a large amount of intellectual property in their own right. To the best of my knowledge, no comparative examination of this kind has ever before been carried out in this field.

Today it is our role as the EPO, a major player in the global knowledge-based economy and as custodian of one of the principal patent offices in the world, to take a lead in ensuring that the system remains fit for purpose in support of innovation, competitiveness and economic growth for the benefit of the citizens of Europe. The patent system has its roots in Europe. In 1474, at the time of the Republic of Venice, the first patent law was enacted. The resulting system by and large has stood us in good stead over the intervening centuries. However, the big question is whether it can still accommodate and adapt to meet the needs of the twenty-first century's information society. The interconnected world of today is unquestionably a turbulent one. A kaleidoscope of complex and dynamic changes is already impacting on our future. The forces of globalisation, geopolitical developments, societal demands and heightened expectations are but a few examples of the multiple pressures bearing down on today's patent system.

For these reasons, when I took office as President of the EPO, one of my first objectives was to initiate a fresh look at the world in which we operate and to see how the forces for change, from both inside and outside the system, might impact on its future. Our aim was to take as broad and as wide-ranging a perspective as possible. This compendium constitutes a central repository for all the diverse and often polarised views obtained from all the interviewees. These views comprise the essential building blocks for the overall examination and analysis we undertook as part of our *EPO Scenarios for the Future* project.

After almost three years, we derived a set of four distinct scenarios which provide us with virtual models to simulate and desk-check our various assumptions about possible futures for patenting and intellectual property. This set of distinctive yet interdependent scenario worlds presents us with plausible, relevant and challenging stories which allow us to determine what its future might possibly look like and what new challenges and opportunities might lay ahead.

Last year, I was invited by the World Economic Forum to speak at its annual meeting in Davos, Switzerland, where representatives of the most powerful economic and political organisations gather to discuss and debate the major social and economic problems of the planet. It may surprise you to know that the subject I was given for my address was 'A World without Intellectual Property'! Naturally, I rose to the challenge and defended the indispensable role of the international system, of which we are an integral part. This most certainly vindicates our wise decision to launch our *EPO Scenarios for the Future* project and reminds us that we need to remain vigilant and ready to listen carefully to the cacophony of voices all around us – voices that are becoming increasingly loud and vocal – while explaining the benefits to the outside world.

In a turbulent world, resilience and adaptability are essential for ensuring a robust future, and there are many important issues that need to be addressed by the system's principal stakeholders. From all corners of the globe, vital questions are being asked about the versatility of today's patent system. Does the patent system properly support innovation and promote technological advancement? How are intellectual property rights and geopolitical influences impacting on innovation in the global economy? Is the balance set fair between the interests of developed and developing countries? Are the interests of the applicant and of society justly balanced? Should generic aspects of scientific research remain in the public domain? Debates around the ethical dimensions of technology are unquestionably on the rise. As we all see on a daily basis in our newspapers, on television and on the internet, these questions are already the subject of heated debate. Why, we should be asking, do these issues generate such impassioned reactions?

A key concern for all of us, and for the EPO in particular as one of the major custodians of the system, must be how best to ensure that the system remains fit for purpose in the future. We hope that our investigations have uncovered the key issues and identified the most relevant questions. We encourage you to join with us in our on-going deliberations, and we hope that our four scenario worlds – each with its own set of unique threats and opportunities – will encourage open dialogue and allow us to reinvigorate the specific role of patents in the innovation process. These scenarios describe possible futures we could all have to contend with. The future is unlikely to live up to all our expectations, but informed decision-making today will help better to shape the world of tomorrow.

While this compendium presents and examines the many and varied viewpoints of all those who so generously contributed, it does not represent the views or opinions of the European Patent Office, nor should it seek to do so. However, as a result of this extensive exercise and the feedback we receive from everyone, I earnestly believe that when the appropriate time comes to initiate our policy-making process, we will be in a much healthier position. Let us hope that this scenario-building exercise will help us on our journey through to awareness and a clearer understanding of all the myriad facets that impact on patenting and intellectual property, and will empower us all in deciding how best to support innovation for the benefit of society.

We look forward to receiving your feedback.

Munich, 18 April 2007

Préface du Président
Professeur Alain Pompidou

Je profite de l'occasion qui m'est donnée pour vous recommander la consultation du présent compendium, formidable aboutissement d'un projet de recherche approfondie qui aura duré trois ans. Ce document nous propose de redécouvrir et de renouveler les principes de base, grâce aux meilleures pratiques qui soient, qui soutiennent notre Organisation et sa finalité inhérente.

Je voudrais ici exprimer ma gratitude à toutes celles et à tous ceux, et ils sont nombreux tant en dehors de l'OEB qu'en son sein, qui ont bien voulu nous accorder une partie de leur temps si précieux pour contribuer à ce processus global. Je les remercie d'ailleurs plus particulièrement pour les efforts sans limites dont ils ont fait preuve, ainsi que pour le partage de leurs idées, en toute franchise, avec les nôtres.

Notre exercice exploratoire a consisté à interroger, de manière officielle, plus d'une centaine de grands spécialistes du monde entier représentant un large spectre de disciplines diverses et variées. Nous avons sélectionné, avec la plus grande rigueur, un groupe de théoriciens éminents et influents afin de les interroger, ces derniers venant d'horizons aussi divers que le monde de l'entreprise, la société civile, le cercle des administrateurs et des responsables politiques, les associations et les organismes internationaux liés à la propriété intellectuelle, les offices de brevets, le monde des média et les établissements d'enseignement supérieur. Le groupe sélectionné comportait également des spécialistes des fondateurs historiques de la coopération tripartite. (Veuillez vous reporter à la liste des participants sur le CD-ROM joint). Ces entretiens constituent des déclarations et des opinions individuelles ayant trait à la délivrance des brevets et à la propriété intellectuelle dans son ensemble et, en cette qualité, ils représentent en soi une grande part de la propriété intellectuelle. Pour autant que je sache, aucun examen comparatif de cette nature n'a jamais été effectué auparavant dans ce domaine.

Aujourd'hui, le rôle de l'OEB en sa qualité d'acteur principal de l'économie mondiale fondée sur le savoir et de responsable de l'un des principaux offices de brevets dans le monde, consiste à prêcher l'exemple en veillant à nous assurer que le système existant demeure adapté à l'objectif d'encouragement de l'innovation, la compétitivité et la croissance économique dans l'intérêt des Européens. Le système de brevets a ses racines en Europe. C'est en 1474, à l'époque de la République de Venise, qu'a été promulguée la première loi sur les brevets. Le système qui en a découlé nous a été de façon générale très utile au cours des siècles passés. Cependant, la question essentielle qui demeure est de savoir si ce système est toujours adapté aux besoins de la société d'information du vingt-et-unième siècle. Le monde d'interconnexion actuel est sans conteste soumis à des bouleversements. Un grand nombre de changements complexes et dynamiques font ressentir d'ores et déjà leurs effets sur notre avenir. Les influences de la mondialisation, des évolutions géopolitiques, des revendications de société et des attentes accrues ne constituent que quelques exemples des pressions multiples qui s'exercent sur le système de brevets actuel.

Toutes ces raisons m'ont conduit, lorsque j'ai pris mes fonctions de Président de l'OEB, à lancer une nouvelle procédure d'observation, avec un nouveau regard, du monde dans lequel nous évoluons et à comprendre comment les facteurs de changement, aussi bien à l'intérieur qu'à l'extérieur du système, pourraient influer sur son avenir. Nous avions pour objectif d'avoir une vision la plus complète et la plus large possible. Le présent compendium constitue un référentiel central de toutes les opinions diverses et souvent polarisées de l'ensemble des personnes interrogées. Ces opinions comportent les composantes de base essentielles de l'examen global et de l'analyse que nous avons effectués comme partie intégrante de notre projet de Scénarios OEB pour l'avenir.

Au terme d'une période qui aura duré près de trois ans, nous avons mis au point un ensemble de quatre scénarios distincts qui intègrent des modèles virtuels nous permettant de simuler et de vérifier pas à pas nos différentes hypothèses concernant les évolutions futures potentielles de la délivrance des brevets et de la propriété intellectuelle. Cet ensemble de situations de scénario différentes et non moins interdépendantes nous présente des récits plausibles, pertinents et stimulants qui nous permettent de déterminer ce à quoi l'avenir en la matière pourrait éventuellement ressembler et d'établir les nouveaux défis et les nouvelles opportunités auxquels nous pourrions faire face à l'avenir.

Le Forum économique mondial m'avait convié, l'année dernière, à m'exprimer lors de sa réunion annuelle à Davos, en Suisse, au cours de laquelle des représentants des organisations économiques et politiques les plus puissantes se retrouvent pour traiter et débattre des principaux problèmes sociaux et économiques de la planète. Vous pourriez être surpris par l'intitulé du thème dont je devais traiter dans mon exposé, à savoir "Un monde sans propriété intellectuelle" ! Je me suis montré tout naturellement à la hauteur de la situation et j'ai défendu avec vigueur le rôle indispensable du système international dont nous faisons partie intégrante. Cette position défend très certainement notre décision, pour le moins sage, de lancer notre projet de Scénarios OEB pour l'avenir et nous rappelle qu'il nous faut rester vigilants et disposés à écouter attentivement les avis qui s'expriment tout autour de nous – avis dont l'expression est toujours plus forte et sonore – tout en expliquant les avantages du système au monde extérieur.

La résistance et l'adaptabilité constituent, dans un monde soumis à des bouleversements, les éléments fondamentaux qui permettent d'assurer un avenir solide, de nombreuses questions importantes devant être par ailleurs traitées par les principales parties prenantes au système. Des quatre coins du globe surgissent des questions essentielles ayant trait au caractère versatile du système de brevets actuel. Le système de brevets encourage-t-il comme il se doit l'innovation et favorise-t-il le progrès technique ? Comment les droits de propriété intellectuelle et les influences géopolitiques agissent-ils sur l'innovation dans l'économie mondiale ? Observe-t-on un juste équilibre entre les intérêts des pays développés et ceux des pays en voie de développement ? L'équilibre entre les intérêts du demandeur et ceux de la société est-il juste lui aussi ? Les aspects génériques de la recherche scientifique devraient-ils continuer à relever du domaine public ? Les débats concernant les dimensions éthiques des technologies se développent de plus en plus. Ces questions, comme nous pouvons tous le constater au quotidien dans nos journaux, à la télévision et sur internet, constituent d'ores et déjà le thème d'un débat passionné. Nous devrions nous interroger quant à la raison pour laquelle ces questions entraînent de telles réactions passionnées.

Faire en sorte que le système demeure opérationnel à l'avenir doit constituer l'une des préoccupations majeures de chacun d'entre nous, et de l'OEB en particulier, en tant que principal responsable de ce système. Nous espérons que nos diverses enquêtes auront révélé les problèmes clés et identifié les questions les plus pertinentes. Nous vous invitons à rejoindre nos réunions de délibération en cours et nous espérons que les quatre situations de scénario que nous vous avons présentées – chacune avec son propre ensemble de menaces et opportunités uniques – favoriseront un dialogue libre et nous permettront par ailleurs de revigorer le rôle spécifique des brevets dans le processus d'innovation. Bien qu'il soit peu probable que l'avenir réponde à toutes nos attentes, l'existence d'un processus de prises de décision éclairées aujourd'hui permettra de mieux façonner le monde de demain.

Le présent compendium qui expose et étudie les avis nombreux et variés de toutes les personnes qui ont largement participé à notre enquête, ne représente en aucun cas les avis ou opinions de l'Office européen des brevets, et tel n'est d'ailleurs pas son objectif. Il décrit les avenirs possibles auxquels nous pourrions tous être confrontés. Cependant, je pense en toute bonne foi que cette démarche extensive, associée aux commentaires fournis par chacun d'entre vous, nous permettra, lorsque le moment sera venu, de lancer dans les meilleures conditions possibles notre processus décisionnel. Formulons l'espoir que cette démarche d'élaboration de scénarios facilitera notre parcours vers une sensibilisation et une meilleure appréhension de toutes les multiples facettes qui influent sur la délivrance des brevets et la propriété intellectuelle, et permettra à chacun d'entre nous de décider comment soutenir au mieux l'innovation dans l'intérêt de la société.

Nous attendons vos commentaires avec la plus grande impatience.

Munich, le 18 avril 2007

Vorwort des Präsidenten
Professor Alain Pompidou

Ich möchte Ihnen dieses Kompendium ans Herz legen, das das Ergebnis eines umfassenden dreijährigen Projekts ist. Es soll Wege aufzeigen, wie wir die Grundgedanken, auf denen die Europäische Patentorganisation (EPO) basiert, und den eigentlichen Zweck unserer Organisation am besten wiederentdecken und neu beleben können.

Ich danke allen, die dem gesamten Prozess innerhalb und außerhalb der EPO ihre wertvolle Zeit gewidmet haben, für ihren großzügigen Einsatz und für die Offenheit, mit der sie uns an ihren Ideen teilhaben ließen.

Im Zuge unserer Sondierungen fanden weit über hundert formale Interviews mit führenden Experten aus der ganzen Welt statt, die auf einem breiten Spektrum verschiedenster Fachgebiete tätig sind. Ausgewählt haben wir dabei herausragende und einflussreiche Vordenker aus Wirtschaft, Gesellschaft, Verwaltung und Politik, aus IP-Verbänden, internationalen Organisationen und Patentämtern – darunter auch die drei Begründer der trilateralen Zusammenarbeit – sowie aus den Medien und akademischen Einrichtungen. (Eine Liste der Beitragenden finden Sie unter der Rubrik “Acknowledgements” und auf der beiliegenden CD-ROM.) Diese Interviews enthalten persönliche Aussagen und Meinungen zum Patentwesen wie auch zum geistigen Eigentum generell und sind damit schon selbst ein enormer Fundus an geistigem Eigentum. Meines Wissens wurde auf diesem Gebiet noch keine derartige Vergleichsstudie durchgeführt.

Als wichtiger Akteur in der globalen Wissensgesellschaft und als eines der größten Patentämter der Welt haben wir – das EPA – heute die Aufgabe, an vorderster Front sicherzustellen, dass das System weiterhin seinen Zweck erfüllen und Innovation, Wettbewerbsfähigkeit und Wirtschaftswachstum zum Nutzen der Bürger Europas fördern kann. Das Patentsystem hat seinen Ursprung in Europa. Im Jahr 1474, zu Zeiten der Republik Venedig, trat das erste Patentgesetz in Kraft. Das daraus entstandene System hat uns in den letzten Jahrhunderten im Großen und Ganzen gute Dienste geleistet. Die entscheidende Frage lautet aber, ob es auch noch den Bedürfnissen der Wissensgesellschaft des 21. Jahrhunderts gerecht werden kann. Die vernetzte Welt von heute ist fraglos turbulent. Ein Kaleidoskop komplexer und dynamischer Veränderungen prägt schon jetzt unsere Zukunft. Die zunehmende Globalisierung, geopolitische Entwicklungen, gesellschaftliche Ansprüche und erhöhte Erwartungen sind nur einige Beispiele für den mannigfaltigen Druck, der auf dem heutigen Patentsystem lastet.

Bei meinem Amtsantritt als Präsident des EPA war es daher eines meiner ersten Ziele, einen neuen Blick auf die Welt zu ermöglichen, in der wir agieren, um Aufschluss darüber zu erhalten, wie die Kräfte des Wandels innerhalb und außerhalb des Systems auf seine Zukunft Einfluss nehmen könnten. Dabei war es unser Ziel, einen möglichst breiten und umfassenden Blickwinkel einzunehmen. Im vorliegenden Kompendium sind die vielfältigen und oft gegensätzlichen Standpunkte der Befragten

gebündelt. Diese Standpunkte sind die wichtigsten Bausteine für die Gesamtuntersuchung und –analyse, die wir im Rahmen unseres Projekts EPA-Szenarien für die Zukunft durchgeführt haben.

Nach fast drei Jahren haben wir nun vier verschiedene Szenarien ausgearbeitet, die uns virtuelle Modelle für die Simulation und Überprüfung unserer Annahmen zur möglichen Zukunft von Patentwesen und geistigem Eigentum liefern. Diese eigenständigen, aber doch ineinandergreifenden Szenarienwelten bieten uns plausible, relevante und provokante Aussagen, die uns Auskunft darüber geben, wie die Zukunft aussehen könnte und welche neuen Herausforderungen und Möglichkeiten uns erwarten könnten.

Letztes Jahr wurde ich vom Weltwirtschaftsforum eingeladen, auf seiner Jahrestagung im schweizerischen Davos zu sprechen, wo die mächtigsten Wirtschaftsführer und Politiker zusammenkommen, um wichtige gesellschaftliche und wirtschaftliche Probleme unseres Planeten zu erörtern. Als Thema für meinen Vortrag wurde mir originellerweise "Eine Welt ohne geistiges Eigentum" vorgegeben! Selbstverständlich habe ich diese Herausforderung angenommen und die unverzichtbare Rolle des internationalen Systems, dem wir als wesentlicher Bestandteil angehören, verteidigt. Dies bestätigt natürlich, wie weise unsere Entscheidung war, das Projekt EPA-Szenarien für die Zukunft ins Leben zu rufen, und erinnert uns daran, dass wir wachsam und bereit bleiben müssen, auf die – anschwellende – Kakofonie von Stimmen zu hören, die sich um uns herum erheben, und zugleich der Außenwelt die Vorteile näherbringen müssen.

In einer turbulenten Welt sind Flexibilität und Anpassungsfähigkeit unentbehrlich, um eine stabile Zukunft zu sichern, und die Hauptakteure des Systems müssen viele zentrale Themen ansprechen. In allen Winkeln der Welt werden Fragen nach der Vielseitigkeit des heutigen Patentsystems gestellt. Ist das Patentsystem geeignet, um die Innovation zu unterstützen und den technischen Fortschritt zu fördern? Welche Auswirkungen haben geistige Eigentumsrechte und geopolitische Einflüsse auf die Innovation in der Weltwirtschaft? Besteht ein ausgewogenes Gleichgewicht zwischen Industriestaaten und Entwicklungsländern? Wird das System den Interessen von Anmeldern und Gesellschaft gleichermaßen gerecht? Sollte die wissenschaftliche Forschungsfreiheit im Allgemeinen gewahrt bleiben? Debatten über die ethischen Dimensionen der Technik sind eindeutig auf dem Vormarsch. Wie wir täglich in der Zeitung, im Fernsehen und im internet verfolgen können, führen solche Fragen bereits zu hitzigen Diskussionen. Daher sollten wir uns fragen, warum diese Themen so leidenschaftliche Reaktionen hervorrufen.

Uns alle und insbesondere das EPA als einen der wichtigsten Hüter des Systems muss die zentrale Frage beschäftigen, wie man bestmöglich gewährleistet, dass das System auch in Zukunft zweckgerecht funktioniert. Wir hoffen, dass unsere Untersuchungen die Schlüsselthemen getroffen und die wichtigsten Fragen ermittelt haben. Wir ermutigen Sie, an den weiteren Beratungen teilzunehmen, und hoffen auch, dass unsere vier Szenarienwelten, die jeweils mit eigenen Risiken und Chancen behaftet sind, den offenen Dialog fördern und es uns ermöglichen werden, die besondere Rolle der Patente im Innovationsprozess zu stärken. Die Szenarien beschreiben potenzielle zukünftige Verhältnisse, mit denen wir alle konfrontiert sein könnten. Wahrscheinlich wird die Zukunft nicht all unsere Erwartungen erfüllen – ein fundierter Entscheidungsprozess von heute wird aber dazu beitragen, dass wir die Welt von morgen besser gestalten können.

In diesem Kompendium werden die zahlreichen und vielfältigen Standpunkte all derer dargelegt und untersucht, die so großzügig zu dem Unterfangen beigetragen haben. Die Auffassungen und Meinungen des Europäischen Patentamts sind darin – ganz bewusst – nicht wiedergegeben. Angesichts der umfassenden Sondierungen und der zahlreichen Rückmeldungen bin ich aber der ehrlichen Überzeugung, dass wir in einer wesentlich stabileren Position sein werden, wenn die Zeit reif ist, um unsere Strategieplanung einzuleiten. Es ist zu hoffen, dass uns diese Szenarienbildung zur Kenntnis und zum besseren Verständnis der vielfältigen Facetten verhelfen wird, die auf das Patentwesen und das geistige Eigentum Einfluss nehmen, und uns alle bei den Entscheidungen stärken wird, wie wir Innovation am besten zum Nutzen der Gesellschaft fördern können.

Wir freuen uns auf Ihre Rückmeldungen.

München, 18. April 2007

EXECUTIVE SUMMARY

Thirty and counting...

This year the EPO is proudly celebrating its thirtieth anniversary. As the regional patent granting authority for Europe and one of the biggest patent granting offices in the world, it is one of the guardians of the intellectual property rights (IPR) system and a key player in the knowledge-based economy. Since its inauguration in 1977 it has grown in size and influence. But the most important factor influencing the EPO's enormous growth is not strictly of its own making: it is more due to the immense success and influence of scientific endeavour coupled with the interlinked and exponential expansion in technological innovation.

Over the past thirty years the pace of innovation has been relentless and there is no apparent sign that this will change. Yet today, with the emerging powers rapidly ascending in the wings, global competitiveness is fiercely on the rise. A recent US report cautioned that without more innovation in science and technology, America's standard of living would suffer.[1] Last year, Tony Blair, the UK Prime Minister, warned that if his country failed to take the opportunities that science presents, it would not have a successful modern economy.[2]

But the impact of science and technology goes far beyond economics: the Pill, television, antibiotics, vaccines, cell phones, the internet etc… have all had a huge impact in the way we live our lives and shape our societies. The three most likely transformations and overlapping facets of the technology revolution that will dominate the first half of this century are genetics (biotechnology), nanotechnology and robotics (artificial intelligence). In the foreseeable future – and even now – ethical issues concerning certain technological developments could force us to question our moral values and the rules that ought to govern human conduct.

Underpinning this scientific and technological advancement is the patent system. It allows for the granting of territorial exclusive rights, in return for public disclosure, so enabling others to build upon the innovation of their predecessors – 'standing on the shoulders of giants'.[3] However, the globally interconnected world of today brings with it complex and dynamic pressures which are already impacting on the ability of the existing patent system to cope – especially in the light of predicted future demands. Changes will inevitably have to be made. All of this gives a strong argument for greater international reciprocity among the various patent regimes.

What began as a successful set of national rules to improve and protect national competitiveness has now been pulled and stretched to accommodate a globally focused information society. Even the business models that have sustained businesses for decades are in the throes of a radical transformation. There is massive disintermediation taking place in the channels of distribution through the web and other new communication technologies, as well as a relentless drive for increased efficiencies in operations and administration.

The patent system is one of the most successful and important components of the system for managing intellectual property rights (IPR) that underpins the global knowledge economy. These rights encompass trademarks, copyright, design rights, appellations of origin as well as patents and other forms of intellectual property (IP). Today, almost everyone, regardless of where they work, whatever their particular interests or profession, and even sometimes whether they realise it or not, has an opinion or concern about some aspect of IP that impacts them in their daily lives. For many, the individual components under the IPR umbrella are inextricably interlinked. This linkage is perhaps not acknowledged by the experts within each field, but the stresses within one set of rights, such as copyrights, can profoundly affect the others, such as patents.

We present here the results of a project that began as a small exercise with a handful of people in the EPO, but has now grown into an important debate about the long-term future of patenting and IP. Our dialogue with various stakeholders began with over 100 interviews. The interviewees were chosen from a wide spectrum of disciplines ranging from industry to society, from small businesses to multinationals, from politics to academia. To the best of our knowledge, this collection of interviews (included on the CD-ROM in this compendium) is the first ever aggregate

> **Standing on the shoulders of giants.**
>
> **Bernard of Chartres used to say that we are like dwarfs on the shoulders of giants, so that we can see more than they, and things at a greater distance, not by virtue of any sharpness on sight on our part, or any physical distinction, but because we are carried high and raised up by their giant size.[3]**

exercise of its kind. It represents our attempt to map the diversity of opinions about the key factors and significant challenges likely to impact the future of patenting and IP.

These interviews provided the building blocks that enabled us to develop a set of four challenging, relevant and plausible scenario stories which describe four possible future worlds. (Interestingly, the traditional 'business as usual' view did not stand up to scrutiny in the face of such dynamic pressures). These scenarios examine the patent system – and to a lesser extent the over-arching system of IP – at global, European and institutional levels. In this document our main focus is at the global level, where major changes are most likely to take place.

Once upon a time...

The patent system evolved gradually over several centuries. The first patent law was enacted in Venice in the fifteenth century, from where the concept evolved throughout Europe and over time to other parts of the globe. There were several variations, yet the concept of a monopoly for invention remained a constant. It was an exclusive right granted for a certain territory for a finite length of time, based on three criteria – novelty, non-obviousness and usefulness – in return for public dissemination of the information. This classic model balanced the interests of society with those of the individual. This model was a dynamic one, as the diffusion of both technology and knowledge spurred further technological innovation, development and progress, so creating a 'virtuous circle'.

Over time the patent system has been exceeded in several dimensions: (i) new areas being covered by patents; (ii) erosion of patentability standards allowing the patenting of trivial 'inventions'; (iii) the link of global trade with IP (TRIPS) which has led to territorial expansion; and, (iv) increasing timescales, with the advent of supplementary protection for drugs which extended the patent exclusivity to make up for the time needed for regulatory approval. In addition, the boundaries between different forms of IP have become increasingly porous.

The growing use of patents and intellectual property has led to blockages throughout the system, and the overriding challenges ahead are threefold; (i) the sheer volume of patent activity, (ii) the increased number of sources generating IP and (iii) the variety of technologies. Business interests are no longer being met as well as they had been because the once 'virtuous circle' has become eroded by problems such as pendency issues, patent thickets, increasing costs and complexity of technology. Societal fears over the nature of technology and the risks it represents are also leading to regulatory or funding restrictions on sensitive research activities.

Today, the nature, role and value of knowledge are changing. Research and development is increasingly a collaborative and global undertaking which is in stark contrast to the past where only small and discerning scientific and industrial communities were involved – now patents are seen as the catalyst that enables knowledge to be shared. There are many questions being asked about today's patent system, but one of the key questions we identified was whether it is and can remain 'fit for purpose' by supporting innovation for the benefit of society at large in a post-industrial era. If not, its legitimacy may be open to question.

The focal questions these scenarios seek to answer are:
How might IP regimes evolve by 2025?
What global legitimacy might such regimes have?

What is shaping the future?

There are many pressures impacting on the patent system – political, economic, societal, environmental, technological and historical – over which its guardians and stakeholders have little or no control. During the course of this project, we identified the five most important driving forces that will create the greatest uncertainty; causing the system to become increasingly complex and unpredictable:

1. POWER

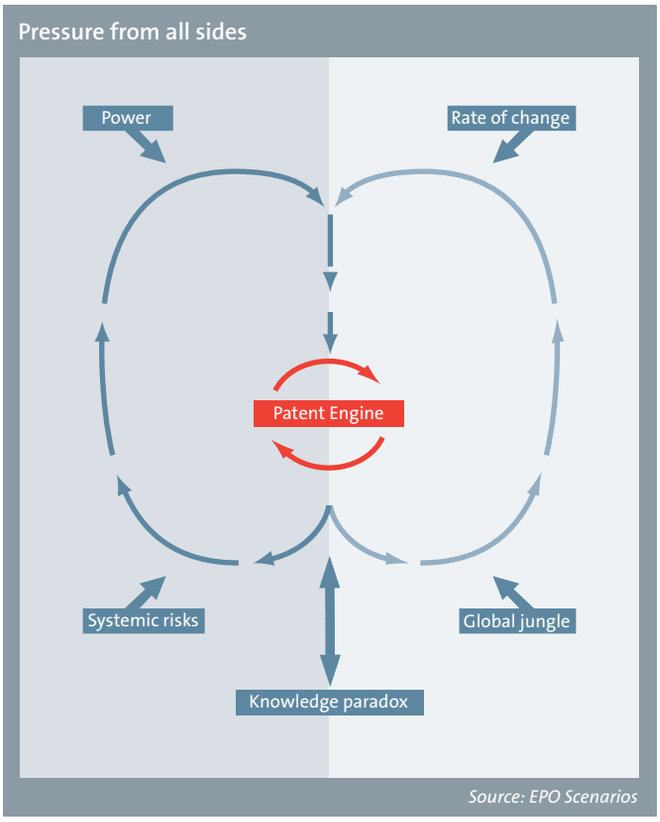
Traditionally, power has been concentrated in the hands of established authority. However, globalisation has redefined this power structure, with established sources of authority – such as governments – challenged by the many new powerful actors that are forming alliances and cutting across traditional boundaries. New players include multinational corporations (MNCs); civil society organisations (CSOs) and global networks of political and special interest movements; international bodies; emerging economies and regional trade blocs; as well as other players, such as private equity investors. The key question that emerges is: *As new and powerful players emerge, who has power and authority?*

2. GLOBAL JUNGLE

Globalisation has integrated national economic systems through international trade, investment and capital flows as well as increased social, cultural and technological interaction. It has accelerated the pace of change, creating economies of scale which has led to an economic, social and political competitive flattening of the world between a multiplicity of players that include countries, regions, hotspots and city states, market sectors, global companies, organisational and business models, consumer markets and workforces, business and universities as well as cultures. In this global jungle, there are many who are ill-equipped to adapt. Protectionist measures – such as increased tariffs or trade restrictions – carry risks. The key question we ask is: *As the rules of the global jungle take shape, who will survive? And for how long?*

3. RATE OF CHANGE

There is a growing tension between, on the one hand, the pace of global economic markets, the rate of change in technology and short-term political cycles; and, on the other, the long-term cycles of political and



legal institutions such as the IP system, as well as human psychology and the environment. The pace of change in the more visible areas makes it difficult to address certain slow variables such as environmental degradation or climate change. The growing divide between the short- and long-term goals leads us to ask: *How do humans and their institutions adjust to cope with the rate of change?*

4. SYSTEMIC RISKS

International flows of finance, people, goods and ideas have created unprecedented global interdependence. There are also major risks created by our dependency on the complex natural and man-made systems that support humanity. The nature of these risks is changing from traditional ones (such as natural hazards) to complex systemic risks. These have been created by the many stresses and uncertainties that together could threaten the integrity of interconnected systems, whether they're economic, social or environmental. Increased population pressures have also given rise to a number of regional, ethnic and cultural conflicts, the rise of worldwide terrorism and, last but not least, the increasing impact of environmental problems. This leads us to ask the question: *As global society becomes increasingly reliant on complex interconnected systems, where are the tipping points that threaten them?*

5. KNOWLEDGE PARADOX

The very nature and availability of knowledge is changing. Society increasingly questions the monopoly ownership conferred by patents. At the same time, the speed of technological obsolescence and the clogged IP system make it harder to derive value from traditional patent usage. And technology now makes information more accessible and counterfeiting simpler, eroding the control a patent holder once exerted. Heavy-handed IPR enforcement is also likely to alienate the public. The transformation of data into information and then into knowledge – information that can be utilised to build capabilities – is also far from straightforward. This raises the question: *As information becomes increasingly abundant, what knowledge has value?*

Complex issues of knowledge access, search, management, production and ownership force us to question the equation: "more information equals more knowledge" and then to ask: *Are there cheaper, quicker methods of protecting and exploiting knowledge than the patent system?*

EPO Scenarios for the Future

This dynamic, unpredictable world has no precedent. The blurred boundaries are creating a Kaleidoscope Society: fragmented yet interconnected, with dramatic demographic shifts taking place. Within the context of such complexity and upheaval, the ability to reflexively navigate and adapt will be critical. From this standpoint in 2007, the world of patenting and IP could evolve in several directions. We have investigated four of them, depending on how the chosen driving forces play out. These then are our scenarios for the future:

Market Rules *a world where business is the dominant driver.*
It's a story of the consolidation of a system so successful that it is collapsing under its own weight. New forms of subject matter – inevitably including further types of services – become patentable and more players enter the system. The balance of power is held by multinational corporations with the resources to build powerful patent portfolios, enforce their rights in an increasingly litigious world and drive the patent agenda. A key goal is the growth of shareholder value. Patents are widely used as a financial tool to achieve that end. In the face of ever-increasing volumes of patent applications, various forms of rationalisation of the system occur and it moves to mutual recognition of harmonised patent rights. The market decides the fate of the system, with minor regulation of visible excesses. Patent trolling, anti-competitive behaviour and standards issues all come under scrutiny.

Whose Game? *a world where geopolitics is the dominant driver.*
This is the story of a boomerang effect which strikes today's dominant players in the patent world as a result of changing geopolitical balances and competing ambitions. The developed world increasingly fails to use IP to maintain technological superiority; new entrants try to catch up so they can improve their citizens' living standards. But many developing world countries are excluded from the process, and work instead within a 'communal knowledge' paradigm. Nations and cultures compete, IP has become a powerful weapon in this battle. The new entrants become increasingly successful at shaping the evolution of the system, using it to establish economic advantage, adapting the existing rules as their geopolitical influence grows. Enforcement becomes increasingly difficult and the IP world becomes more fragmented. Attempts are made to address the issues of development and technology transfer.

Trees of Knowledge *a world where society is the dominant driver.*
In this story, diminishing societal trust and growing criticism of the IP system result in its gradual erosion. The key players are popular movements – often coalitions of civil society, businesses, concerned governments and individuals – seeking to challenge existing norms. This Kaleidoscope Society is fragmented yet united – issue by issue, crisis by crisis – against real and perceived threats to human needs: access to health, knowledge, food and entertainment. Multiple voices and multiple world views feed popular attention and interest, with the media playing an active role in encouraging debate. This loose 'knowledge movement' echoes the environmental movement of the 1980s, initially sparked by small, established special interest groups but slowly gaining momentum and raising wider awareness through alliances such as the A2K (Access to Knowledge) movement. The main issue is how to ensure that knowledge remains a common good, while acknowledging the legitimacy of reward for innovation.

Blue Skies *a world where technology is the dominant driver.*
The final story revolves around a split in the patent system. Societal reliance on technology and growing systemic risks force this change; the key players are technocrats and politicians responding to global crises. Complex new technologies based on a highly cumulative innovation process are seen as the key to solving systemic problems such as climate change, and diffusion of technology in these fields is of paramount importance. The IP needs of these new technologies come increasingly into conflict with the needs of classic, discrete technologies. In the end, the patent system responds to the speed, interdisciplinarity and complex nature of the new technologies by abandoning the one-size-fits-all model: the former patent regime still applies to classic technologies while the new

How might IP regimes evolve by 2025?			
Market Rules	**Whose Game?**	**Trees of Knowledge**	**Blue Skies**
Business as dominant driver.	Geo-politics as dominant driver.	Society as dominant driver.	Technology as dominant driver.
The story of consolidation in the face of a system that has been so successful that it is collapsing under its own weight.	The story of conflict in the face of a boomerang effect that strikes the dominant players as geopolitical balances shift and competing ambitions emerge.	The story of erosion in the face of diminishing societal trust and growing criticism of the patent system.	The story of differentiation of the patent system in the face of global crises, societal reliance on technology and the threat of systemic risks.
Key questions			
Could ever-increasing volumes overwhelm the patent system?	What are the main drivers for future geopolitical change? How might they steer globalisation?	How can public and private interest in IP be reconciled for the benefit of society?	How can technical expertise be identified and measured? By whom?
Will the desire for patent rights continue to increase, or will there be new forms of IP protection?	What impact might this have on existing structures and institutions?	How are the ethical and moral dilemmas raised by technology reflected by the patent system?	How can valuable knowledge be protected in emerging and complex technological fields?
How might issues of enforcement impact the further development of patent rights as a financial asset?	How might this impact the IP system globally and regionally?	Where should the limits to patentability be drawn? By whom?	Should the one-size-fits-all system be abolished to meet the needs of different technological sectors, where will the boundaries be drawn? By whom?
Does the patent system offer business protection in the face of ever-increasing competition?	**Does the patent system serve the world's various interests fairly?**	**Does the patent system benefit society?**	**Can the patent system adapt to the changing nature and pace of technology?**
...and a way to test this is to see whether business maintains its use of patent protection in the era of globalisation.	...and a way to test this is to look at least developed countries (LDCs) and other developing countries.	...and a way to test this is to examine whether it achieves a balance between rewarding innovation and providing goods and knowledge to the public.	...and a way to test this is to check whether a bifurcated patent system can better respond to the needs of technology and society.
What legitimacy might such a regime or regimes have?			
Business says 'yes' to IP; other views are irrelevant.	No global legitimacy; competing national and regional IP systems.	No legitimacy for classic monopoly rights; legitimacy for open and collaborative innovation.	IP reform restores global legitimacy.

ones use other forms of IP protection, such as the licence of rights. The patent system increasingly relies on technology, and new forms of knowledge search and classification emerge.

Looking ahead

The purpose of scenarios is to examine possible uncertainties that might arise in a complex and turbulent environment. By deploying this methodology, a wider view can be taken and more relevant questions can be asked. This approach encourages a holistic examination of the system and exposes the complex interactions that might impact it. By thinking the unthinkable, and questioning structures that are ordinarily taken as a given, it is possible to better anticipate and adapt to future changes.

From these deliberations, we have developed a set of four distinct, yet interdependent scenario worlds, each with its own divergent future. Traditionally, the world of patents has been viewed through the familiar lens of the grey *Market Rules* scenario. However, the scenario process demonstrates that it is unwise not to take a much wider perspective into account: the other three scenarios reveal further dimensions often overlooked by the IP system.

The patent system, which evolved over centuries to support an industrialised world, now has to adjust to meet the needs of tomorrow's post-industrial era. Globalisation accelerates global competition, which in turn encourages more innovation as new products are marketed and sold worldwide; this also leads to more exchanges of ideas and technology. A challenge will be to harmonise ways to deal with the growing number of such exchanges, the world of *Market Rules*.

The system must also accommodate the multiple players and stakeholders from different cultures and with different worldviews and aspirations who are working towards different goals within a global environment. The challenge here will be to find a way of meeting the specific developmental requirements of disparate nations at global level, because a system that blocks the access of poor people to essential drugs or food will eventually lose its credibility. This is the world of *Whose Game?*

Civil society is increasingly engaged in the IP debate, and this interest is likely to significantly shape the agenda of the 'commons' debate. As questions around the public benefits of IP gain traction, we enter the world of *Trees of Knowledge*.

The subject-matter protected by the patent system is changing, too. Technologies become increasingly fast, interdisciplinary and cumulative, increasing the tensions on the patent system and leading us to *Blue Skies*.

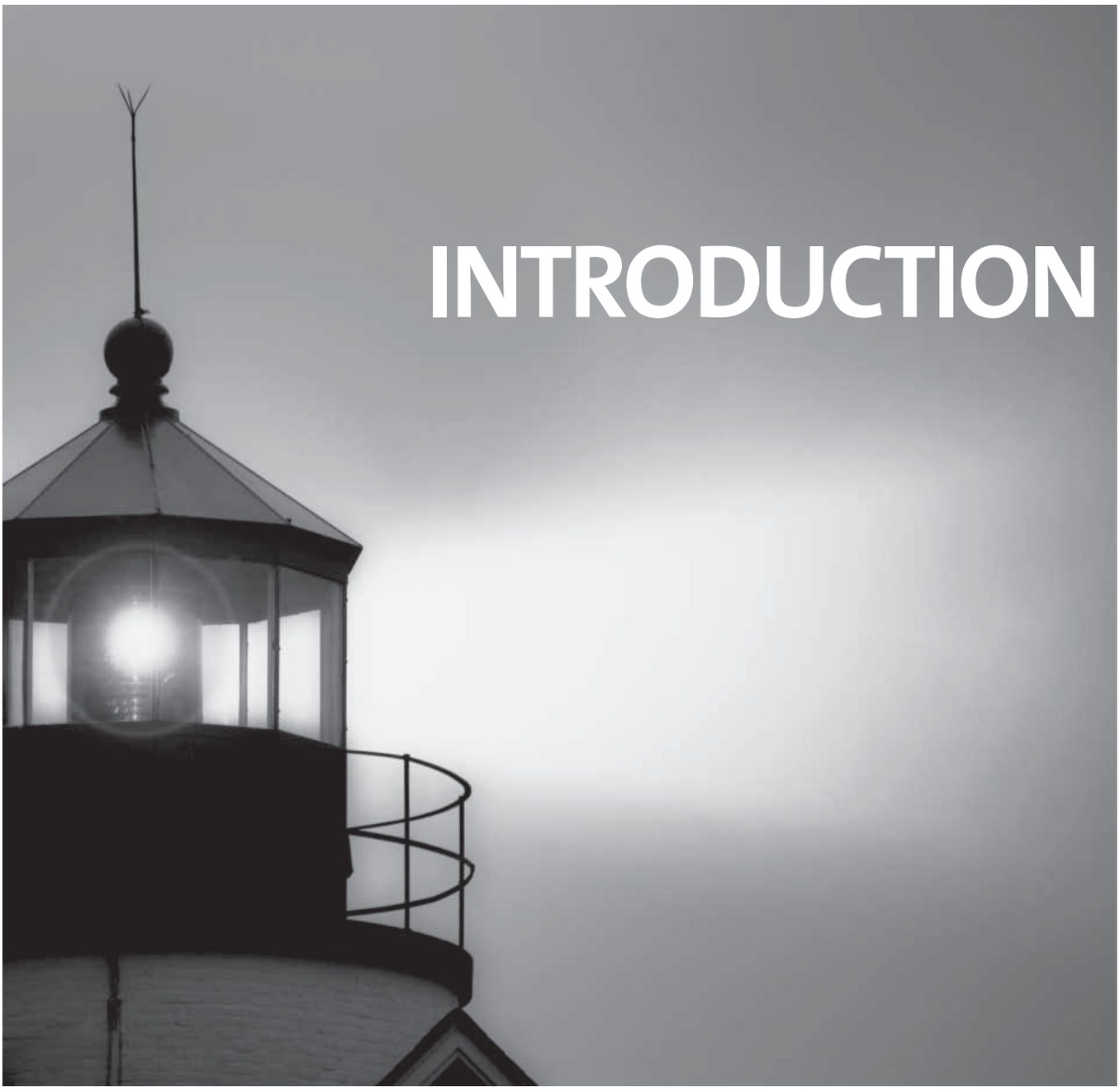
Asking the right questions

We developed these scenarios in order to understand the landscape in which the patent system functions. But looking at possible futures is not enough. It would be irresponsible not to consider how the system needs to adapt and what role we can play to ensure that it remains fit-for-purpose. There are many voices questioning its current suitability. As interested parties, we cannot afford to ignore these messages, nor should we stand by idly without communicating the underlying benefits of the system.

The patent system is far too complex, and the issues far too diverse for any single group of stakeholders to decide its future. These scenarios are not intended to prescribe solutions, but aim to provide the right questions for input into the policymaking process. Our hope is that the wide-ranging perspectives contained within this compendium will go some way to encourage reflection and increase the understanding of a system where issues are not simple but complex, and interlinked by a vast array of forces. We hope that this exercise will support and stimulate a broad and informed debate – one that appears to have commenced already in many quarters, among many people around the world.

At the core is the growing importance of knowledge, and the question is how best to adapt to the fundamental changes in the way in which knowledge is being produced and used within the global society. That question is one we at the EPO have tried to explore with our *EPO Scenarios for the Future* project – and the answer lies in all our hands ■

A word of warning: the views contained in these scenarios do not represent in any form those of the EPO. They are, like all good scenarios, designed as a set of challenging, relevant and plausible stories of possible futures.



INTRODUCTION

In March 2004 Professor Alain Pompidou decided to prepare for his imminent role as President of the EPO by sponsoring the *EPO Scenarios for the Future* project. The project was meant to consider what the patent system might look like in 20 years time, in order to gain greater clarity about the threats and opportunities the future might present.

What has become clear during the three years since the project started is that the EPO does not operate in isolation. It is a key player in one of the most successful and important components of the knowledge economy. The knowledge economy spans the globe, yet patents have always been territorial by nature. This represents a potential mismatch with a world that is becoming increasingly global in nature.

So the fact that the EPO, the European supra-national or regional office, celebrates its 30th anniversary is a significant event. The creation of the European Patent Office was a milestone in the history of the patent system – "the creation of a focused institution instead of those many disparate national countries," as the Hon. Gerald J Mossinghoff, co-founder of the trilateral cooperation between the EPO, USPTO and the JPO, describes it. And as the late founding father of the EPO, Johannes Bob van Benthem said, "Before 1940 there were multiple national economies, each with its own national patent system. After 1945, as the European Economic Community was established and the economy spread territorially, so a regional patent system was developed. This European patent system was characterised by one office, one procedure and one standard of quality. We now have a situation within Europe where the German population trusts a European patent granted by an Irish or Italian examiner of the European patent system. This has been a major innovation."

The evolution from national to regional, making a single granting procedure equivalent to procedures in a number of different countries, represents to some a roadmap for the future. Others think there are more preferable roadmaps available.

Why scenarios?

Scenarios are challenging, relevant and plausible stories about the future, used as tools to generate policy dialogue. They do not attempt to predict the future, but set out the landscape of a wider environment that encourages reflection on how the future might unfold. By taking a long-term view, it is possible to examine a range of possible realistic outcomes that might have to be faced and therefore make more informed decisions. Unfortunately, these possible futures rarely represent the most desired ones.

Scenarios are concerned with the external driving forces over which an organisation or system has little or no control: the political, economic, societal, ethical, technological, environmental and historical pressures that could impact the system and the way it functions. The issues at stake and the most likely driving forces that might force change on the system are identified by a team of scenario builders as a collective brainstorming process.

The project

In April 2005 a small team, the project taskforce, met to synthesise over 60 open-ended interviews on the future of the intellectual property (IP) regime. These interviews were the first phase of a process undertaken by the EPO which enabled the Office to explore the multiple viewpoints of those outside and inside the system. The chosen interviewees were people considered to have opinions worth capturing, with viewpoints not generally known to the Office. They come from a cross section of worlds, from industry to society, from small businesses to multinationals, from politics to universities.

Over the next year, a further 40 interviews were conducted. These later conversations were more detailed and examined more carefully the specific areas identified during the initial phase of the project. To the best of our knowledge, this collection of interviews – contained on CD-ROM within this compendium – represents the first-ever aggregate exercise of its kind: an attempt to map the diversity of opinions about the key factors and significant challenges likely to impact the future of IP in general and patents in particular.

Once these interviews were undertaken, it was necessary to collate them and try to identify common threads and concepts. To do so, a scenario-building process took place within the EPO. This involved many individuals, drawn from all subject areas and all four EPO locations. The wealth of issues represented in the interviews and subsequent ideas drawn from more focused research were absorbed and translated into the scenarios presented in this compendium.

What had started as a small institutional exercise rapidly grew into a larger more comprehensive overview of the whole IP system. It became clear that the system of intellectual property required comprehensive examination, on multiple levels, ranging from global to regional (European), national and institutional levels. What is presented here is a synthesis of our work at the global level, where primary evolution or transformation will take place.

The questions these scenarios aim to answer are:
How might IP regimes evolve by 2025?
What global legitimacy might such regimes have?

The issues

The sheer diversity of issues considered relevant to the patent system became apparent during the scenario-building process. Intellectual property rights encompass trademarks, copyright, design rights, appellations of origin as well as patents and other forms of IP. Patenting is one of the most successful components of the IP system which underpins the globalised economy. Today, almost everyone, whatever their field of expertise, has an opinion about the global intellectual property rights umbrella. For the man in the street, though perhaps not for the experts who work within the system, the various forms of intellectual property are not easily distinguished. This means that, to the lay public, the IP system is inextricably interlinked: copyright and patents are often indistinguishable and not always understood.

During our interactions with this wide array of stakeholders, it became clear that the viewpoints of our interviewees encompassed a vast and diverse range, way beyond the legal and technical issues normally associated with intellectual property law. These dimensions ranged from societal and political to economic and technical, confirming our premise that the success of the system has resulted in the emergence of many new players, each with their own interests and concerns for the future.

For almost every theme there is a spread of different views, often the full gradation between two polarised extremes. Clearly, intellectual property is a controversial issue. The world of patents is no longer an invisible backwater of trained legal and technical professionals, managing their workload and delivering their judgements. It is a world where all stakeholders want their say – and are ready to fight to ensure that they're heard. This transition has happened so quickly that it has been hard for many inside the world of patents and intellectual property to recognise all the changes and adapt to the very different environment in which they now operate.

Our analysis indicates that the IP system is one facing profound change. Some of these changes have taken place during this exercise; others are imminent; many more are still being debated or proposed. There are more questions than answers – and more competing interests than agreed solutions. It is, in short, a world where conflict and the need for change co-exist.

While some people question whether the system can or should survive, most believe that some measures for promoting innovation are indispensable. However, even supporters of the existing regime have concerns over the basic principles governing the patent system that go well beyond the mere adaptation of administrative practices and procedural rules. These questions go to the heart of the system, forcing fundamental examination of the role of patents. How can it provide those crucial incentives to innovators developing new answers to today's problems? And can it do so while also ensuring that the interests of society – of all societies in the world – are also served? These are the kind of dilemmas that are explored in this compendium.

The EPO Scenarios for the Future

The following pages set out our analysis. First we describe the evolution of the patent system over the centuries. Then the five critical, unpredictable driving forces – Power, Global Jungle, Rate of Change, Systemic Risks and Knowledge Paradox that operate within the context of a Kaleidoscope Society. After that, we explore four scenarios: relevant and plausible worlds designed to challenge our view of what will shape the future for IPR. The one certainty is that the future is cloudy: it could be any one, or a mix of any of the four, coloured worlds that we have sketched out.

This compendium does not attempt to provide solutions: our aim is simply to ask questions and to initiate informed debate in all quarters. Our hope is that the wide-ranging perspectives contained in this compendium will encourage reflection and increase the understanding of a world where issues are not black and white, but shades of grey – revealing a complex, dynamic, interconnected system interacting with a vast array of external forces ■

“The [most important historic event] was the invention of patenting itself – the creation of a system whereby a monopoly was created, and simultaneously the knowledge made accessible for everyone. This accessibility is in my opinion an important issue. The alternative way – protecting knowledge by keeping it secret – is a disastrous way of using knowledge.”

Dr J Staman,
Director, Rathenau Institute, Netherlands (EPO Interview)

EVOLUTION OF THE SYSTEM

The quest for knowledge has always been part of the human condition, and this has taken many forms over the centuries. Traditionally secrecy was paramount, but in 1474 the first patent law was enacted in Venice. This law awarded inventors and importers of new techniques a ten-year term of exclusive rights if the invention was believed to be useful. England followed with the Statute of Monopolies in 1623 under King James I, which declared that patents could only be granted for "projects of new invention." The concept of a monopoly for invention spread throughout Europe and, over time, to other parts of the globe. The form it took varied depending on the needs of the society it served. But the concept behind the patent remained the same: it was a monopoly privilege granted by government for a finite length of time, based on three criteria – novelty, non-obviousness and usefulness – in return for public diffusion of information.

The primary role of patents was to transfer technical knowledge. Patents provided a template for other inventors to refine the innovation; disclosure removed unnecessary redundancy in the knowledge production system. They were also used as an incentive to persuade foreign skilled workers to settle and foster local industries. The privilege granted was often calculated in terms of the benefit it provided to society. This benefit has been long recognised; indeed, the protection of intellectual property was an integral part of the American Constitution of 1787.

"Throughout the history of the United States, intellectual property has been a fundamental tenet of the economy and the country – with some even going so far as to say that it has been responsible for the rise of the United States' economic prosperity." Jon W Dudas, Under Secretary of Commerce for Intellectual Property and Director of the United States Patent and Trademark Office (USPTO).[1]

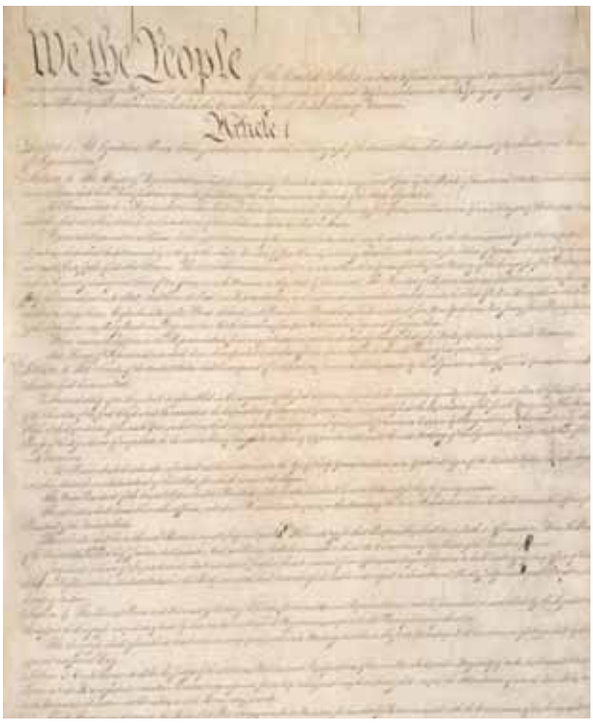
With a monopoly right, the patentee can sell the technology and/or license it to third parties to generate revenues. Both will lead to the diffusion of the invented technology as well as profits for the patentee that can be re-invested into R&D. Disclosure leads to the diffusion of information, as well as new technology. This contributes to an increase of scientific knowledge and tools that can be used to research new problems and generate new patents.

Expansion of the system

The territorial nature of patent rights has always allowed others outside the specific jurisdiction to imitate or adapt the invention without payment. As the industrialised world began to trade more and the extent of copying grew, these territorial limitations became more evident. This led to the seminal 1883 Paris Convention for the Protection of Industrial Property. A simple two-page document drafted at the time of the great exhibitions, it was designed to encourage inventors of the day to show their inventions without fear of theft. The initial membership was small: only 13, mostly European, members – the industrialised world of the time. Today there are 171 member states across the world.[2]

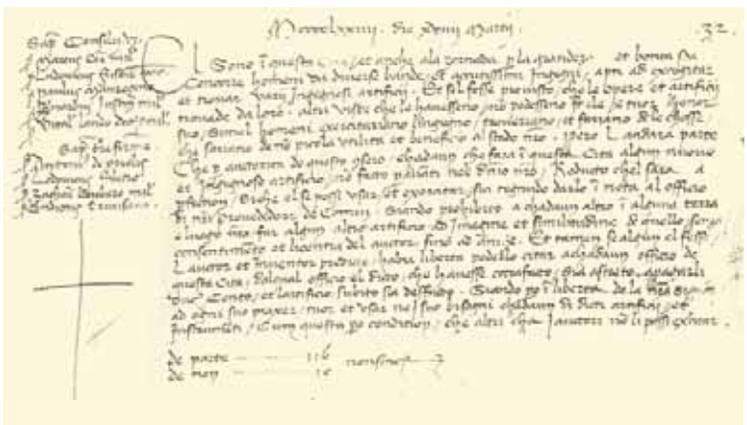
The Paris Convention allows an applicant who applies for a patent in any member state to file further applications in any other member state during one year, while keeping the date of the first filing as the relevant date for all applications. It ensures uniform terms of protection and legal remedy between foreigners and nationals. But it also contains areas subject to national choice. This inbuilt flexibility ensured that as more countries became industrialised they joined the Convention. Patents became the backbone of the industrialisation process at both national and regional levels, and there are countless examples of companies being established on the basis of a single, strong patent.

The 1970 Patent Cooperation Treaty (PCT), under the framework of UN's World Intellectual Property Organisation (WIPO), took this a stage further. It defined a common set of rules for the filing and initial stages of prosecution of a patent application – a step closer to harmony between the different systems around the world. The PCT has currently 136 member states.[3] Linked to this is the growing co-operation between the Trilateral



Left: Protection of intellectual property was enshrined in the American Constitution of 1787. "To promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries;" (US constitution, Article 1, Section 8).
Source: The National Archive Experience[6]

Below: The first patent law was enacted in Venice in 1474.
Source: Camera di Commercio di Venezia



Offices of Japan (JPO), the United States (USPTO) and Europe (EPO). These three offices are currently responsible for 75% of international patent activity, and the standardising of certain procedures between their systems is seen as a critical development.

The third major step in the evolution of the patent system has been the move towards regionalisation. After the creation of the African and Malagasy Patent Rights Authority (OAMPI) in 1962 covering 12 African countries, the 1973 European Patent Convention set another precedent, this time within the industrialised world. This trend towards more regional groupings, to negotiate or advance common economic interests, is likely to continue.

Intellectual property and trade

Organisations operating at the global level like harmonisation: different regulations between countries lead to significant costs and uncertainties. So several attempts were made in the 1980s within WIPO to further harmonise IP laws worldwide. However, many developing countries resisted the introduction of stronger forms of IP protection. Given the lack of results in that period, pressure grew to shift the diplomatic venue from WIPO to GATT, the General Agreement on Tariffs and Trade.

The advantages for the industrialised world were twofold: first, developed countries had a much greater say within the GATT; second, the connection between trade and IP (and trade-related sanctions for non-compliers) was essential to get enforceable results. Several emerging economies (especially Brazil and India) actively negotiated the GATT and TRIPS (Trade Related Aspects of Intellectual Property Rights) agreements, hoping for enhanced market access to, and greater investment from, industrialised states. TRIPS came into force in 1995 and harmonised several aspects of IP law for all member states of the WTO.[4]

New areas

With the rise of information technology and biotechnology in the second half of the 20th century, new technical fields became amenable to IP protection. But despite a few precedents – Pasteur's patent on isolated yeast, for example – living matter had traditionally been excluded from patenting until, in 1980, the US Supreme Court upheld the patentability of a genetically modified bacterium quoting a Congressional report that "anything made by man under the sun" should be patentable. The landmark Diamond v Chakrabarty decision, and several others in the US and in Europe, widened the possibilities of protecting newer technologies with patents.

However, patentability criteria vary across the world. For example, while in the US software is in general patentable, European law requires computer implemented inventions (CIIs) to be 'technical' in nature, because software 'as such' is excluded from patentability; US patent law allows the patenting of business methods[5] which are explicitly excluded from patentability in Europe.

These extensions of areas of patentable subject matter have led to controversy – about the ability of the system to cope, the ethical and moral dimensions, the impact on smaller innovators, and so on. But the world has clearly changed, as Prof Michel Santi of the HEC School of Management in Paris, makes clear: "Today we are in an economy that has shifted, where services represent 70% of GDP. Services are quite transparent, unlike industrial techniques, and are therefore very easy to understand and imitate. Services do need intellectual property to protect those things that are so easy to copy."[7]

Patentability standards

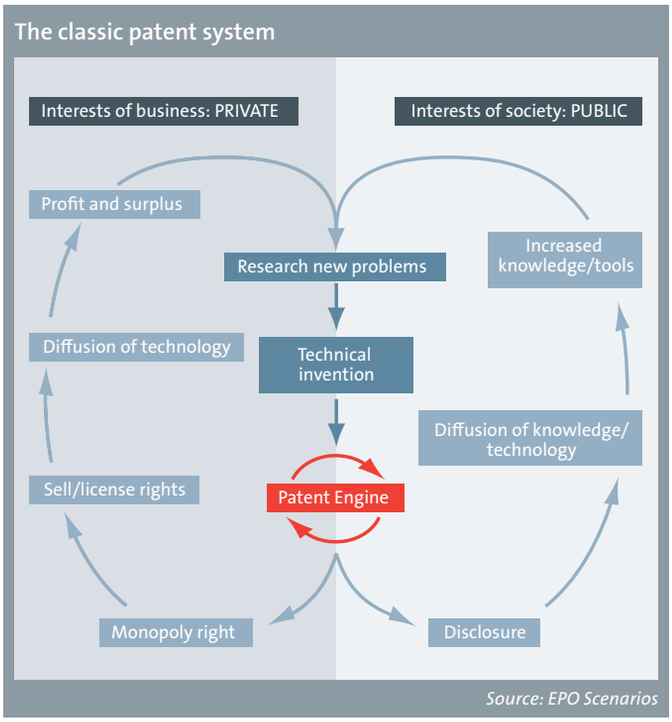
'Quality' in the patent system is assessed on the presumption of validity that can be attached to a granted patent. The purpose of the search and examination procedures conducted by the patent office is to ensure a reasonable certainty to both the patentee and the wider world about the validity of the granted patent. In applying the patentability criteria (novelty, non-obviousness, usefulness) the system aims to strike a balance between the reward for the inventor and the interest of the public to have unrestricted access to the invention. The scope of the claims of a valid granted patent also indicates where infringement starts.

In the patent system that came to maturity in the 20th century, quality depended on the competence of the examiners as well as the time and search material available to them. Substantive examination required an understanding of the technology in question and an ability to assess whether the invention was 'obvious'. Given proper training and access to good collections of prior art, offices could aspire to granting patents with a high presumption of validity.

At the end of the 20th century, there have been more broadly expressed concerns about quality in

> **Once the technology has been protected as intellectual property, it is then possible to convert it into products and new businesses, bringing in revenues. The income from these revenues can then be invested in research and development and the creation of further technology and content, so creating a virtuous circle.**
>
> **Hiroshi Ogawa**, previously Commissioner, Japan Patent Office (EPO Interview)

Right: The classic patent system is a balance between the interests of society and those of private business interests. This system is not static, however, as the diffusion of both technology and knowledge spurs further technological innovation, development and progress. That process creates a 'virtuous circle'.



Is there a problem of 'capture' – the status quo being lucrative for many players, but lacking effective or consistent policy oversight and being hard for outsiders to engage with?
See page 71

the patent system. The operational challenges that have raised these questions include:

- The high volume of applications, many of which may not proceed to be granted but which meanwhile sit as potential threats to others' inventions.
- The time it takes to determine the fate of an application.
- The assessment of the inventive merit of an application.
- The patentability of new fields, notably software, business methods and biotechnology.

High volumes lead to backlogs. This creates opportunities for industry to exploit uncertainty: high volumes of pending applications become bargaining chips in negotiations. Although such delay is rarely in the wider public interest, for some applicants it is convenient – for example, where technologies have a long pay-back period, or where the precise utility of an invention is not apparent at the time of filing. There is also concern that, faced with high pendency rates, patent offices ask examiners to work faster, risking them missing relevant prior art or misjudging obviousness.

The changing economic role of patents

In the last decades of the 20th century, the role of patents changed drastically. At one time, the value of a corporation lay in physical assets – land, plants and raw materials. Today, intangible assets – often protected by IP rights – make up an increasingly large percentage of the value of publicly traded companies. Moreover, unlike physical assets, they are usually highly scalable – they can be reproduced or exploited at little or no cost to the owner. This growing interest in patents has been fuelled by the combination of a globalising economy; the increased ability to enforce IPR and win large damages in key jurisdictions such as the US; new technologies that have wider uses than the traditional industrial applications; and the increased prominence of business models that utilise non-core patents as a source of revenue. So, for many companies, a patent registration is now no longer an expensive way to placate engineers – it is a primary means to generate value.

What was once the preserve of a small legal and technical department now often forms an integral part of boardroom strategy. Patents are no longer simply a defensive shield, but a key weapon of corporate strategy. The constant threat of potential litigation by patent holders puts pressure on others to enter into patenting – described by some as an 'arms race', particularly in the IT field. Technology licensing is big business, generating an estimated US$45bn annually in the US, and approximately US$100bn worldwide;[8] and patents are one of the keys to unlock the door to those revenues.

As the quantity of patents has increased, patent thickets – multiple upstream patents, where overlapping rights may impede the commercialisation of a product or process – have emerged, blocking innovation by others. In order to accommodate this, patent pools have been established. These cooperative arrangements allow the holders of several patents, all of which are necessary for the development of a product or process, to license or assign their rights at a single price. But pools can be expensive to negotiate, can exclude patent holders with smaller numbers of patents or enable a group of major players to form a cartel that excludes new competitors.

The problems caused by a multiplicity of patents over a single area – so-called 'royalty stacking' – can cost so much that it hampers innovation. The large numbers of property owners who have to grant permission for a resource to be used might result in 'the tragedy of the anti-commons,' signifying chronic under-use of resources and the stifling of innovation.[9]

Research and development

Traditionally, universities and research organisations have done basic research whereas business has applied it, obtaining patents for the resulting products. However, the 1980 Bayh-Dole Act in the US, and similar legislation elsewhere in the world, encouraged non-profit organisations such as universities to protect their IP rights and benefit from downstream inventions. This encouraged new forms of partnership, but there is now also growing competition between business and universities.

These changes also undermine the system of research exemption, where research and testing on patented subject matter does not constitute infringement of the rights.[10] Commercial considerations mean that information that would once have been freely shared is now no longer so readily available, causing inaccessible journal articles, tools locked up behind complex contracts, patent licensing of basic research and data obscured by end-user licences.

New technologies are also increasingly complex and interdisciplinary, which presents major technical challenges to the current system. These technologies are also more likely to be the result of combined intellectual input and effort

Key treaties and significant events

Date	Description
1449	**England's first 'Letters Patent'** – issued by Henry VI (20 year grant)
1474	**Edict of Venice** – first Patent Law (10 year grant)
1501	**The (earliest) German privilege** – issued by the Aulic Council
1503	**First copyright privilege** – issued in France
1518	**First copyright privilege** – issued in England
1623	**Statute of Monopolies, England** – original source of the Anglo American Patent Law. It limited the power of the Crown to the grant of monopolies to making such grants only to inventions for limited periods (14 years) and only for "manners of new manufacture"
1710	**UK Statute of Queen Anne** – first modern copyright statute
1790	**The Patent Commission of the US** – created to promote the Progress of Science and Useful Arts
1883	**Paris Convention for the Protection of Industrial Property** – provided international minimum standards of industrial property protection; right of priority; principle of national treatment
1885	**Patent Monopoly Act, Japan** – establishment of the JPO
1886	**Berne Convention for the Protection of Literary and Artistic Works** – provided international minimum standards of copyright protection; principle of national treatment
1891	**Madrid Agreement** – provided the international registration of marks
1962	**Libreville Agreement** – establishing the African and Malagasy Patent Rights Authority (OAMPI) with 12 member states (mostly French-speaking countries) to create a single body to act as the national patent rights authority for each of them. Renamed to African Intellectual Property Organization (OAPI) by the adoption of a new convention signed in Bangui in 1977
1967	**Convention establishing the World Intellectual Property Organization (WIPO)** – constituent instrument of WIPO, signed and entered into force 1970
1970	**Patent Cooperation Treaty (PCT)** – provided a unified procedure for filing patent applications in its (then) 137 Contracting States
1970	**Indian Patents Act**
1973	**European Patent Convention (EPC)** – signed in 1973 and entered into force in 1977, it established a centralised patent grant system administered by the European Patent Office
1976	**Lusaka Agreement** – agreement on the Creation of the African Regional Industrial Property Organization (ARIPO) for 16 English–speaking African countries signed. Entry into force: 1978
1978	**European Patent Office** – opened its door for first European patent applications
1980	**The Patent Office of the People's Republic of China (CPO, the predecessor of SIPO)** – founded
1980	**US Bayh-Dole Act** – created a uniform patent policy among the many federal agencies that fund research, enabling small businesses and non-profit organisations, including universities, to retain title to inventions made under federally-funded research programmes
1982	**US Court of Appeals for the Federal Circuit (CAFC)** – established
1984	**US Hatch-Waxman Amendments** – amendments to the Federal Food, Drug, and Cosmetics Act which significantly revised the generic drug approval process and provided for the extension of the term of a patent to account for patent life lost due to the time necessary for Food and Drug Administration approval of a pioneer drug
1995	**World Trade Organisation** – came into being (150 members in Jan 2007)
1996	**Office for Harmonisation in the Internal Market (OHIM)** – agency of the European Community and official authority carrying out the procedures for the Community trade marks and (since 2003) also for the Community registered design. These intellectual property rights are valid in all the countries of the EU
1996	**WIPO Copyright Treaty (WCT) and WIPO Performances and Phonograms Treaty (WPPT)** – harmonized the rights of performers and producers of phonograms in the Contracting states
1998	**US Digital Millennium Copyright Act (DMCA)** – a United States copyright law which criminalised production and dissemination of technology whose primary purpose is to circumvent measures taken to protect copyright
1998	**EC Biotech Directive (98/44/EC)** – harmonised EU Member States' laws with respect to the patentability of biotechnological inventions
2000	**Clinton/Blair statement** – US President Clinton and British Prime Minister Blair agree on Open Access to Human Genome Sequence
2000	**London Agreement on the application of Article 65 EPC (not yet in force)** – commitment of the Parties to the Agreement to waive, entirely or largely, the requirement for translations of European patents to be filed in their national language
2001	**Doha Declaration** – a WTO clarification on TRIPS Agreement
2001	**EC Copyright Directive** – adapted legislation on copyright and related rights to technological developments and particularly to the information society and transposes at Community level the main international obligations deriving from WCT and WPPT to which the European Community is a party

SEMINAL PATENT CASES

1974	**Cohen-Boyer Patent** – the first patent application filed for the Cohen-Boyer technology for recombinant DNA which resulted in three US patents, one process patent for making molecular chimeras and two product patents—one for proteins produced using recombinant prokaryote DNA and another for proteins from recombinant eukaryote DNA, cited by many as the most successful patents in university licensing
1980	**Diamond v Chakrabarty case** – patent protection allowed in the US to man-made micro-organisms: "everything under the sun made by man" is patentable
1998	**State Street Bank decision** – patentability of business methods in the US admitted if the invention involves some practical application ("it produces a useful, concrete and tangible result")
1999	**Decision of the EPO Enlarged Board of Appeal G1/98** – unless individually claimed, plant varieties are not excluded from patentability under Article 53(b) EPC
1999	**Edinburgh Patent case** – grant of a European patent No. 0695351 to the University of Edinburgh covering 'animal' embryonic stem cells, ignition of debate about ethical aspects of biotechnological inventions as 'animal' can be interpreted as extending to humans. Opposition proceedings initiated in 2000 resulted after oral proceedings in 2002 in a significant limitation of the patent
2001	**Basmati case** – rejection of a number of claims for Basmati Rice by the USPTO in the wake of an uproar in India and Pakistan following the original grant by the USPTO
2004	**Nakamura v Nichia case** – strengthening of rights of employee-inventors in Japan

from many people in different places, and their development costs are often enormous, so protection is key to success. And in some fields – such as software – legal and economic scholars are questioning whether the patent system properly reflects the cumulative nature of research leading to inventions with small incremental changes.

Globalisation

Globalisation has brought many more players into the system. Industrialised countries are increasingly facing vigorous competition from the innovative developing countries (IDCs) – such as Brazil, India and China – which have become innovators in their own right. In terms of US patents granted per capita per year and corrected for the country's GDP, India is the third most productive, and China fourth, behind the US and Japan.[11] Some of these new stakeholders have begun to question how a 19th century Western system can be adapted to the needs of the 21st century. How can the system adapt to radically different technologies in a global environment? How can it accommodate – fairly – multiple players with different values who are working towards different goals? To what extent does a reinforcement of the patent system stimulate innovation and diffusion of technology, and what limits should be set accordingly? There are no longer any straightforward answers.

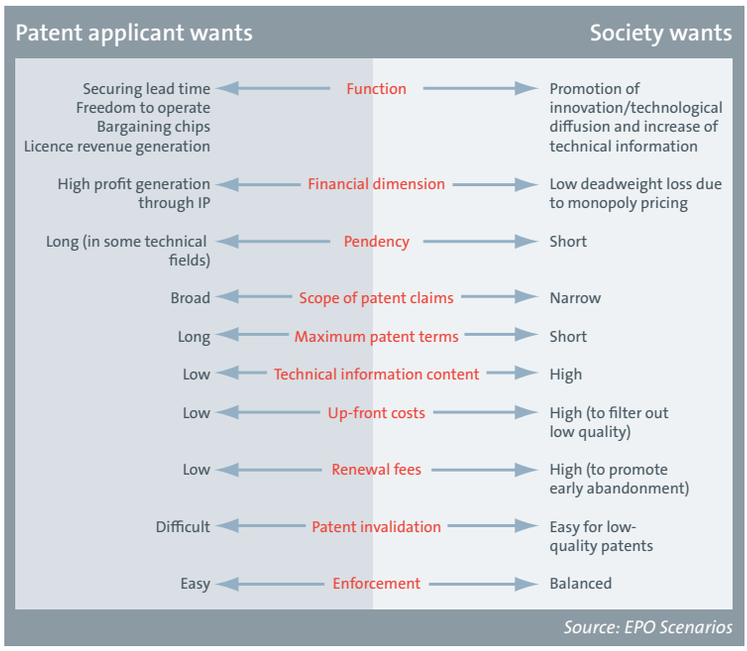
IP and development

While developed countries and their R&D-based industries are satisfied with the greater IP leverage obtained via TRIPS, developing countries have become aware of the pitfalls of the agreement they signed. For instance, in 2000 the South African government considered dealing with the HIV/AIDS crisis by compulsory licensing of the necessary anti-retroviral drug patents. Several pharmaceutical companies sued.[12] This case led to widespread debate on TRIPS and its implications for key issues such as public health, capital transfers from poor to rich countries and the price to be paid for technology use and transfer.

Then there's the question of protections for traditional knowledge and genetic resources.[7] For example, many developing countries want to share the benefits of knowledge about indigenous life-forms and centuries-old traditions in accordance with the UN Convention on Biological Diversity by linking it to the international IP system.[13] One way to achieve this would be a mandatory declaration in the patent applications of the source of any genetic material or indigenous knowledge used in developing a final product.[14]

But in view of the slow progress made in renegotiating TRIPS, the US and other developed countries have chosen to press ahead with bilateral or regional Free Trade Agreements instead. These usually include so-called 'TRIPS-plus' clauses[15, 16] that impose higher standards and more limited exceptions than are provided for under TRIPS itself.

> **So much weight is attached to technology development in this era that countries fiercely compete with each other to develop cutting-edge technologies. Consequently, many similar technology development projects are concurrently carried out around the world, and development costs are becoming enormous. In this situation, the current system of granting the patent right, which is an absolute right, to only one engineer who developed the most advanced technology in the world could cause waste of technology development efforts. The engineers in the second and third places may also deserve some kind of privilege.**
>
> **Yoichi Omori**, Executive Director of the Institute of Intellectual Property (IIP), Japan (EPO Interview)



The interests of patent applicants and society often diverge
For the patent applicant, enforceable rights that provide a competitive advantage are paramount. If this can be achieved at low cost, so much the better. While patent applicants want to recoup as much of their investment as possible, society asks for affordable goods. Society wants to promote innovation, but also has an interest in keeping knowledge in the public domain, in particular in areas where patents are not necessary to stimulate innovative activity. Society prefers early and complete disclosure of new inventions, while the patent applicant prefers to keep some information secret.

These complex systems and devices are much less likely now to be stand-alone products or 'silos' created by a vertically integrated organisation. Now we're seeing devices based upon technology convergence and integration.
See page 88

Ethical dilemmas and public debate

IP is becoming increasingly recognised as an important issue for society at large. For example, the 'Edinburgh' Patent related to human embryonic stem cells was restricted after opposition by many parties, after the original decision to grant had raised widespread ethical objections and unleashed unprecedented media attention.[17] Although the 1623 British Statue of Monopolies contained a provision which can be interpreted as excluding 'immoral inventions' and several patent laws contain exclusions of inventions 'contrary to morality' (for example, the EPC, and Japan), it was the patenting of biotechnological inventions and computer programs that provoked broader debate on these issues. There have been several landmark patents and decisions that have brought the patent system to the attention of a broader public (such as Diamond v Chakrabarty, the Oncomouse[18] and BRCA1).[19]

The debate on the ethics of patents has also moved on to broader arguments around developmental issues, the risks of new technologies and the promotion of research and innovation. Civil society, NGOs and other groups (such as churches, doctors, farmers) have, for example, criticised patents for medical and agricultural technology. While in some cases the underlying technology is attacked (stem-cells, GMOs), in other cases the social and economic effects of patents are put into question: since patents provide a limited monopoly, they can limit public access to goods, such as in the case of AIDS drugs in South Africa. While many experts agree that pharmaceutical patents are just one of the problems associated with the AIDS epidemic, they became a lightning rod for public debate, obscuring other issues such as lack of health infrastructure or the taxation of medicines.[20]

Perceptions of the patent system have historically been cyclical – the pendulum has swung from demand for monopoly protection to resistance to its impact on competition and free trade. Today the cycle appears to be moving towards a more negative perception. This has happened before: in 1869 the Netherlands abolished patents and the system was only reintroduced in 1911. As Dr Francis Gurry, Deputy Director General of WIPO says, "The problem today is one of public perception, and the lack of broad understanding of the role, functioning and importance of intellectual property. At present, the debate is too black and white: users versus consumers. The users of the system see the benefits, while consumers have more difficulty in doing so."[21]

As society in the industrialised world becomes increasingly atomised – and society in the developing world becomes better informed – so differences in world views become more visible. The concept of patenting 'life' is a particularly thorny issue. Another concern, especially for the developing world, is that control and pricing of many essential food crops now lie in the hands of a few multinational corporations. While there is considerable clarity and agreement on what the purpose of the IP system should be, there is much less agreement about how it can be achieved. These issues reveal conflicts between different beliefs and world views, not simply interests. They also challenge the homogenising premise of TRIPS: perhaps one size does not fit all. Maybe different rules are required by different societies. Perhaps different technologies also require different rules. Can any individual or business patent knowledge created by centuries of communal learning? Is it ethical to patent any life form, however small? How can communities benefit from the knowledge they share and the biodiversity they have stewarded over long periods of time?

Enforcement and litigation

Enforcement is crucial to the survival of the patent system: the costs of litigation are starting to freeze out smaller or poorer players. Can a system that is perceived by many to be unfair be maintained without increasing coercion – or even greater levels of litigation? Enforcement is also becoming increasingly difficult as technological advances have made it easier to copy IP. And there are local challenges: once a European patent is granted, enforcement goes back to the diverse national systems, each with its own case law. Clearly, achieving some form of geographically distributed coordinated court system should be a priority.

Governance issues

The transition from national legislation, offering protection within state borders, to new institutions across geographical and other boundaries has continued. However, emerging regional groupings have not led to the removal of the older, national institutions. Instead, national, regional and international groups co-exist side by side, constantly negotiating, collaborating but also competing with each other in their daily affairs.

As Thierry Stoll and Jacqueline Minor of the European Commission say, "It is essential to keep all strands of the debate – those at national, regional and global levels – going simultaneously, yet the concerns are different. At national and regional level the issues hinge around competitiveness and innovation concerns, and finding the right balance for rewarding innovation. At global level competitiveness is still an issue, but there is also the rich/poor, North/South balance – and a risk that patents might be swept into the wider political debate on the development agenda."[22]

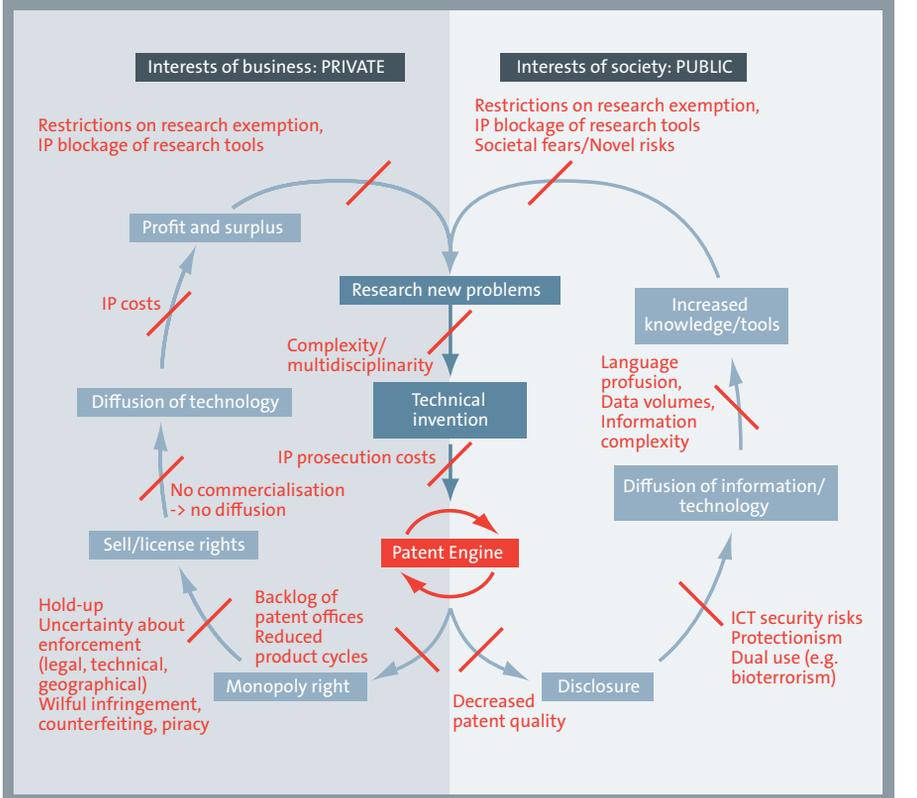
Governance of these IP organisations – which includes ensuring widespread participation and achieving efficiency while maintaining accountability and transparency – is no easy task. These public institutions operate on the frontiers of technology and have to finance complex operations while around them national boundaries in knowledge production and diffusion are becoming blurred. "The most important question anyone can ask the patent office is whether it can maintain a neutral position. Sheer neutrality is impossible, and anyone who believes the patent office is neutral is deceiving himself," says Dr Tom Murray, President, The Hastings Center and Former Commissioner of the National Bioethics Advisory Commission.[23]

Most national patent and trademark offices are politically controlled by ministries and are financed either through fees or a dedicated government budget. National patent laws are enacted by national parliaments. Regional offices (such as the EPO) are controlled by representatives of the member states who are often heads of national patent offices, leading to certain conflicts between national and regional interests.[24, 25] Substantial legal changes require a Ministerial Conference to be convened, and all member states' parliaments have to ratify the amendments. This takes considerable time and makes it difficult to adapt to changing circumstances quickly.

Financing is important. Most patent systems levy both up-front fees and further renewal fees, paid during prosecution and after granting. These fees cover administrative costs and also create a barrier to prevent low-quality applications or the renewal of patents with little economic value. Patent offices can be financed directly by the incurred fees (as the EPO) or indirectly by the government which in turn receives the patent fees (as the USPTO before 1991, when the system was changed to financing through fees).[26]

Renewal fees are payable only on pending and granted patents, so there is a potential bias in the system towards granting.[27] For the EPO, the fact that member states receive half of the renewal fees after grant has led to further criticism.[28] But the indirect financing model has also been attacked and even attracted lawsuits from applicants who feel that their fees are being diverted to the general treasury rather than being used to improve the patent system. Critics have proposed different models of fee distribution that would be more in line with the economic function of patents.[29]

Blockage of the classic patent system



Source: EPO Scenarios

System failure?

The sheer number of applications and the scale of technological innovation are evidence of the importance of the current patent system. However, the growing use of patents and intellectual property has led to blockages throughout the system.

"The current world backlog stands at over 10 million unexamined patent applications," says Jon W Dudas, Under Secretary of Commerce for Intellectual Property and Director of the USPTO.[30] "However, there is a lot of redundancy within the current system and it needs to be addressed, because many of these 10 million have no certainty of legal protection and the technologies could otherwise be available to the market."

Business interests are no longer being met as the virtuous circle is eroded:

- The value of the monopoly right is undermined by pendency issues – the patent right comes too late (particularly detrimental in fields with short product cycles) – and by the difficulties and costs of enforcement.
- Patents are used to ring-fence technologies or to prevent other parties from either researching or commercialising their inventions.
- One product based on complex technologies can be subject to hundreds of patents, so no single company can protect its innovation on its own.
- Growing costs of obtaining patent protection and increased litigation and licensing transaction costs due to royalty stacking.
- The ability to research new problems is declining in some areas due to a limited research exemption and patented research tools.

Societal interests are no longer being met as the virtuous circle is eroded:

- Decreased patent quality makes disclosures less suitable as technical information. The sheer volume and poor quality of applications make it increasingly difficult to use patent documents.
- Knowledge diffusion is compromised as scientists realise that information is potentially valuable and that open collaboration might not be in their best interests.
- The patenting of basic research tools is hampering primary research. There are calls for 'Open Science' models and for basic information to remain a public good.
- Societal fears over the nature of technology and the risks it represents are causing restrictions to research activities.

Alternative systems

There are several alternatives to patents which can also promote innovation.

Secrecy

Technical inventions can be kept secret in areas where it's not easy to reverse-engineer a product. However, technical information might leak out, destroying the basis for the monopoly. And as no disclosure takes place, public knowledge gain is restricted and the amount of new knowledge fed into R&D activities is low.

Open Source/Open Science

Open Source software relies on copyright to enforce licence conditions set by its creators. In the Open Science model, no IP protection is claimed; reward comes from peer recognition. Open Source is a collective process, so diffusion of technology is enhanced while profits are reduced as they are shared by many participants.

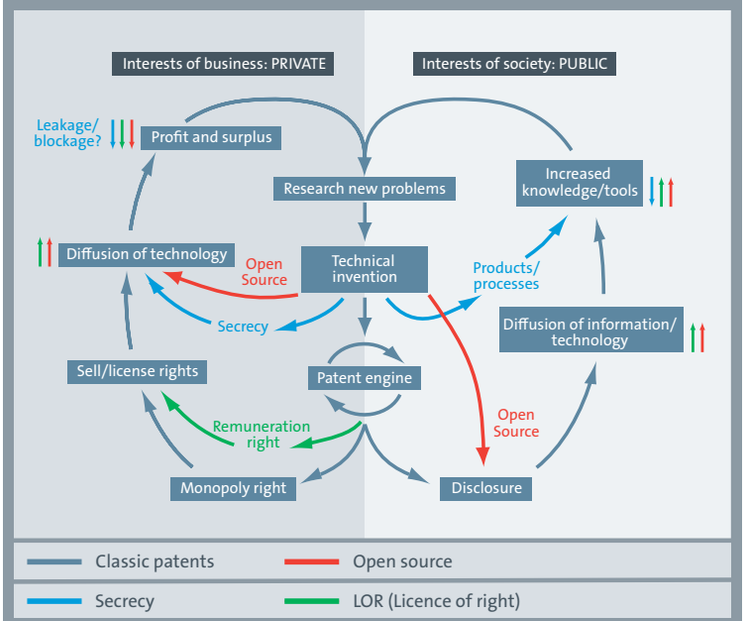
Licence of right (liability regime)

This replaces the monopoly conferred by patents (effectively an exclusion right) with a remuneration right. Information diffusion and public knowledge gain will be higher than under a patent regime; profits might fall as technology has to be shared with third parties.

Push and pull systems

There have been proposals for several alternative models to finance drug research.[31] They all try to close the gap between the price and marginal costs of drugs by using push or pull mechanisms to promote innovation in fields considered to be relevant to public health ■

Different IP models

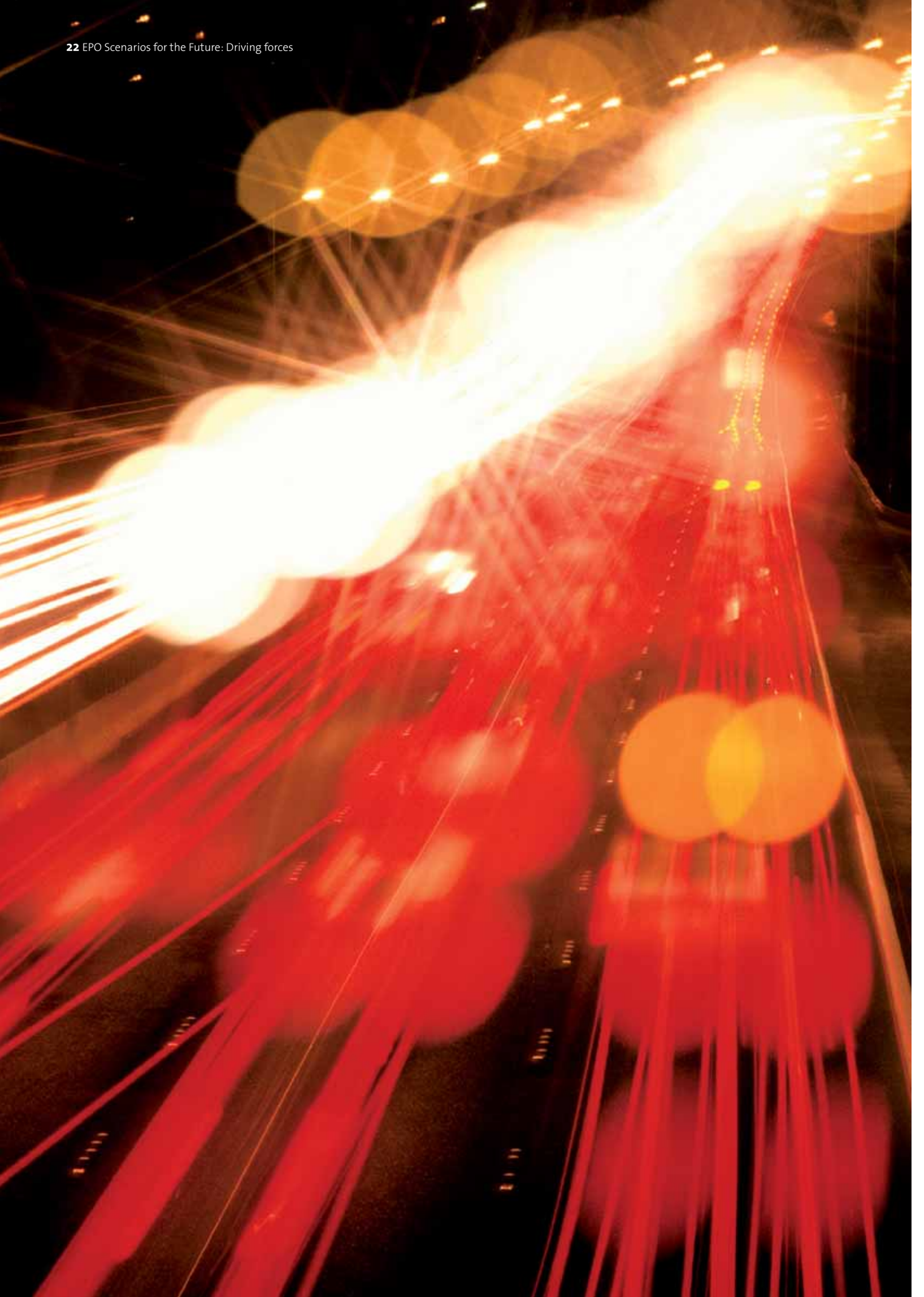


Source: EPO Scenarios

Patent governance: The multi-level patent system

	National patent offices	Regional (EPO)	International (WIPO)	International (WTO)
Purpose	Patent (often also trademark) granting authority for a national territory.	Patent granting authority for Europe under the European Patent Convention (EPC), providing a uniform granting procedure for a 'bundle' of national patent rights.	Established in 1967 with the mandate to promote the protection of IP throughout the world, since 1974 specialised agency of the United Nations system of organisations, with a mandate to administer intellectual property matters.	Established in 1995 on trade rules resulting from the Uruguay round talks ratified by member governments. WTO deals with the rules of international trade, with administering world trade agreements (covering goods, services and intellectual property, e.g. TRIPS) and provides a forum for trade negotiations.
Political control	National Government, via a) Department of Trade/Commerce e.g. US; UK b) Ministry of Justice, e.g. Germany c) Ministry of Economy, Trade and Industry, e.g. Japan; France d) State Council (direct authority), e.g. China	European Patent Organisation of currently 32 member states (27 European Community members, and 5 other member states). Administrative Council: supervisory body composed of representatives appointed by governments of member states (usually heads of NPOs); Ministerial Conferences, representatives of member states.	Member states (currently 184) determine the strategic direction and activities through the governing bodies (Assemblies of Member States and of the Unions created by WIPO Treaties), committees and working groups. The International Bureau is the Secretariat of the Organisation.	The General Council with representatives from all (150) member governments is the highest-level decision-making body, meeting regularly to carry out the functions of the WTO. It has the authority to act on behalf of the Ministerial conference which only meets about every two years. The works are coordinated by the secretariat.
Financial control	a) Allowance from Treasury, usually revised annually[1] b) Percentage of renewal fees[2]	Self-financing through fees, with percentage of renewal fees going to member states.[3]	Largely self-financing from the services which WIPO provides to users of the international filing and registration systems (PCT, Madrid system, The Hague System etc.). Small contributions from Member States.	Individual contributions calculated on the basis of shares in the total trade conducted by WTO members. Part of the WTO budget goes to the International Trade Centre.
Executive Power	Head of Patent Office, appointed by and reporting to the responsible government body.	President and Vice Presidents – appointed by national government representatives in the Administrative Council.	Director General (DG) – appointed by the General Assembly. Deputy Directors General – appointed by the DG after approval by the Coordination Committee.	Director General (DG) of the WTO secretariat – appointed by all member states representatives by consensus (no voting). Deputy Directors – appointed by the DG.
Legislative Power	National Parliaments	Administrative Council: for amendments of Implementing Regulations to the EPC (Rules) Diplomatic Conference: for substantive changes to the EPC (Articles).	Diplomatic Conference convened by General Assembly For the Harmonisation agenda: the Standing Committee on Patents (SCP) For the TK/GR issues: the Intergovernmental Committee on Intellectual Property and Genetic Resources, TK and Folklore (IGC) For the Development agenda: the Provisional Committee on Proposals Related to a WIPO Development Agenda (PCDA)	Ministerial Conference can take decisions on all matters under any of the multilateral trade agreements. The TRIPS Council consisting of all WTO members administers the TRIPS Agreement. Proposals submitted by Member States to the Council aim at modifying the minimum substantive standards contained in the Agreement, interpreting them or adding new standards to the existing ones.
Judicial Power	a) National Courts b) Specialist Patent Courts, e.g. CAFC (US), Federal Patent Court (Bundespatentgericht) in Germany, Patent County Court in the UK, Intellectual Property High Court in Japan. c) Supreme Court in important cases, e.g. House of Lords in the UK, Bundesgerichtshof (BGH) in Germany, US Supreme Court.	Boards of Appeal and the enlarged Board of Appeal create case law for the EPO which often serves also as a (non-binding) guidance to national courts. National patents resulting from the EPO granting procedure are subject to national judicial procedures (see left).	WIPO Arbitration and Mediation Center: cases relate to patent disputes, software/IT, copyright and employment issues in an intellectual property context, consultancy and engineering disputes, and domain name disputes.	The Dispute Settlement Body is made up of all member governments, usually represented by ambassadors. The permanent seven-member Appellate Body is set up by the Dispute Settlement Body and broadly represents the range of WTO membership.
Checks and balances	In some countries: Third-party observations (pre-grant), opposition (pre- or post- grant), inter- or ex-partes re-examination.	Third-party observations (pre-grant), opposition (post- grant).	Decisions in policy matters are almost exclusively taken by consensus in various WIPO bodies.	Decisions are taken by consensus and power is not delegated to a board of directors or the organisation's head.

1 According to critics, this model makes policy planning for the Patent Office difficult, due to the vulnerability of public funding variations.
2 According to critics, this model has the potential to encourage a pro-granting patent policy, as revenue stream is linked to numbers of granted patents.
3 According to critics, this model has the potential to encourage a pro-granting patent policy, as revenue stream is linked to numbers of granted patents and benefits national patent offices.



DRIVING FORCES ON THE SYSTEM

There are many forces that impact the patent system – political, economic, societal, environmental, technological and historical – over which its guardians and stakeholders have little or no control. During the course of this project we identified the five most important driving forces that will create the greatest uncertainty; causing a system that is already under strain to become increasingly complex and unpredictable:

1. POWER
2. GLOBAL JUNGLE
3. RATE OF CHANGE
4. SYSTEMIC RISKS
5. KNOWLEDGE PARADOX

These five driving forces operate within the context of the one predetermined element we have identified: the Kaleidoscope Society. This is the increasingly dynamic, fragmented, interconnected global society that is grappling with major demographic shifts.

1. POWER

All over the world, governments have come to plan less, own less, and regulate less, allowing instead the frontiers of the market to expand.[1] Traditionally, political power has been concentrated in the hands of established authority. However, globalisation has redefined this power structure. Liberalism has led to decentralised decision-making, a reduced role for the state and its institutions, alongside increased economic and social freedom for organisations and individuals. In short, the state is retreating from its role as the major source of power – and leaving a vacuum in its wake.

Essentially, the power of the state and that of the market are geared towards the allocation of scarce resources in societies. Relations between states and markets are increasingly complex and centre around four areas. Knowledge structure (science and technology) drives production (who makes what, where, when and how), which in turn determines financial flows (control of monetary and fiscal infrastructures). These three areas keep states and other constituents safe within the fourth global structure, security. The control of knowledge (in particular IP), plays an increasing role in this 'knowledge economy' since those who own these vectors of production are best-placed to determine their own futures. So the rules and institutions (both nationally and supra-nationally) that determine the management of IP in the global knowledge structure have become eminently political.

A collision has been observed between established sources of authority and the many new powerful actors which are forming alliances and cutting across traditional boundaries. This is often a clash between vertical centralised structures and the newer, more adaptive, horizontal networks[2] – with the latter, of course, far less accountable than the traditional hierarchies. New players include:

- Multinational corporations (MNCs).
- Civil society organisations (CSOs) and global networks of political and special interest movements.
- International bodies, emerging countries and regional trade blocs.
- Others, such as private equity investors and financing organisations.

The increasing number, power and influence of these stakeholders raise questions about democratic legitimacy, transparency and accountability.[3] Without legitimacy and accountability, the governance of society becomes increasingly difficult.

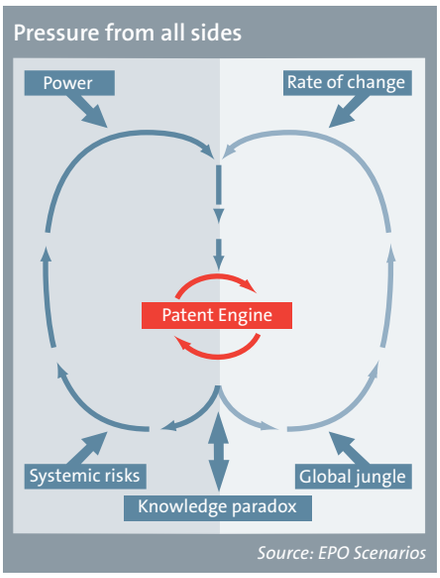
The key question that emerges is: *As new and powerful players emerge, who has power and authority?*

Multinational corporations

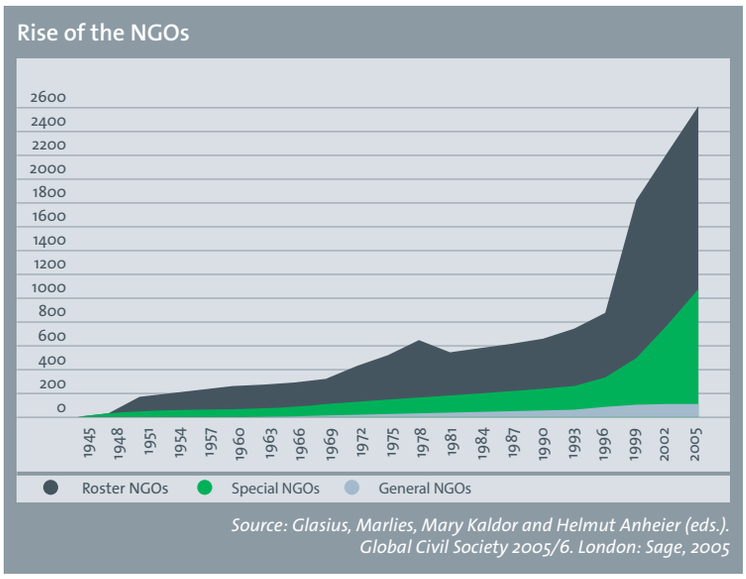
Multinational corporations (MNCs) are legal institutions, collectively owned by shareholders, operating in more than two countries, with a mandate to increase shareholder value. Typically, large companies still employ two-thirds of their workforce and produce more than two-thirds of their output in their home country – which, in the case of 85% of MNCs, is one of the wealthy members of the OECD.[4] (Globalisation also means that large corporations could evolve from being MNCs to trans-national companies, which are genuinely global and are not rooted in any one country). The number of MNCs has grown dramatically with the improvements in communication and the creation of the World Trade Organisation (WTO), which deepened the deregulatory logic of economic globalisation. Ira Jackson, former director of the Center for Business and Government at Harvard, says that corporations and their leaders have "displaced politics and politicians as… the new high priests and reigning oligarchs of our system."[5]

These corporations have expanded beyond their domestic borders, gaining access to new resources, cheaper labour and new markets for products. They enable goods from the developing world to reach markets in the developed world, and are agents of technology transfer to these developing countries.[6] While this expansion has created employment and growth in many developing economies, it has also given corporations greater political power, particularly over governments of smaller countries that are more economically reliant on their activities.

Many MNCs have recognised concerns about their power and accountability, hence their growing interest in corporate social responsibility (CSR). However, this can create



Above: These five critical forces, alone or in combination, interact with the IPR system and will clearly put pressure on the way it works. The exact effect of these pressures remains uncertain, but what is clear is that these forces will make a system already under pressure increasingly complex, unpredictable and dynamic.



Above: The graph[14] shows INGOs (International Non-governmental Organisations) holding consultative status with the Economic and Social Council (ECOSOC) of the UN, the body that coordinates standards-making and problem-solving in economic and social issues. 'General category' organisations are concerned with most of the activities of the ECOSOC and its subsidiary bodies. 'Special category' is granted to NGOs that are concerned specifically with only a few of the fields of activity covered by the ECOSOC. 'Roster organisations' can make occasional and useful contributions to the work of ECOSOC, and tend to have a rather narrow and/or technical focus.

tensions between the conflicting interests of stakeholders and shareholders. According to Milton Friedman, Nobel prize-winning economist, "If John Browne [CEO of BP] pursues those environmental interests in such a way as to run the corporation less effectively for its shareholders, then I think he's being immoral. He's an employee of the stockholders, however elevated his position may appear to be."[7]

Civil society organisations (CSOs) and NGOs

The World Bank defines civil society as "the wide array of non-governmental and not-for-profit organisations that have a presence in public life."[8] NGOs are "private organisations that pursue activities to relieve suffering, promote the interests of the poor, protect the environment, provide basic social services, or undertake community development,"[9] but the term can be applied to any non-profit organisation that is independent from government.[10] The size, scope and capacity of civil society has grown dramatically over the past decade. The number of international NGOs grew from 6,000 in 1990 to 26,000 in 1999.[11] In 2004, the number of internationally operating NGOs was estimated to be more than 50,000.[12]

Increased global interconnectivity – largely thanks to the internet – has enabled smaller groups to make a larger public aware of their cause. The anti-globalisation demonstrations at WTO and G8 meetings are widely viewed as signs of the influence of CSOs. The Convention on the Prohibition of Landmines, the establishment of the International Criminal Court (ICC) and the adoption of the Cartagena Protocol on Biosafety are all regarded as the results of NGOs networking with like-minded States and multilateral bodies.[13]

International bodies

International organisations and regional groupings are not a new phenomenon. Global organisations such as the International Red Cross and Red Crescent Movement and INTERPOL date back to a previous wave of 'globalisation' in the 19th century. But as well as these global bodies, there are organisations with specific membership criteria (such as the OECD or OPEC) and a third category, organisations with a regional focus, such as the African Union and European Union. Globalisation has spurred on the formation and evolution of such bodies.

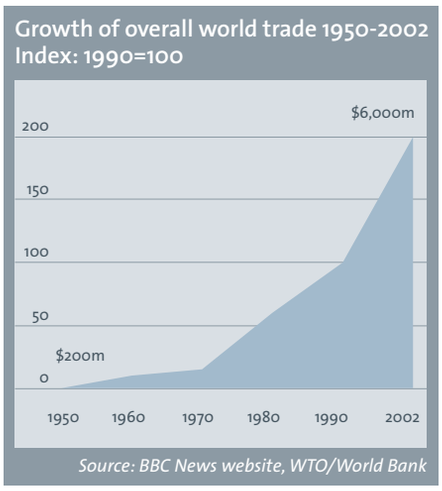
What many of these organisations have in common is supranationality: decisions made by the organisation as a whole are binding on member states, even if they disagree.[15] Vera Franz of the Information Program at the Open Society Institute, says this can result in 'policy laundering', the use of international forums as an indirect means of pushing policies that could never win direct approval through the regular domestic process.[16] International forums simply tend to lack the direct democratic control present in national systems.

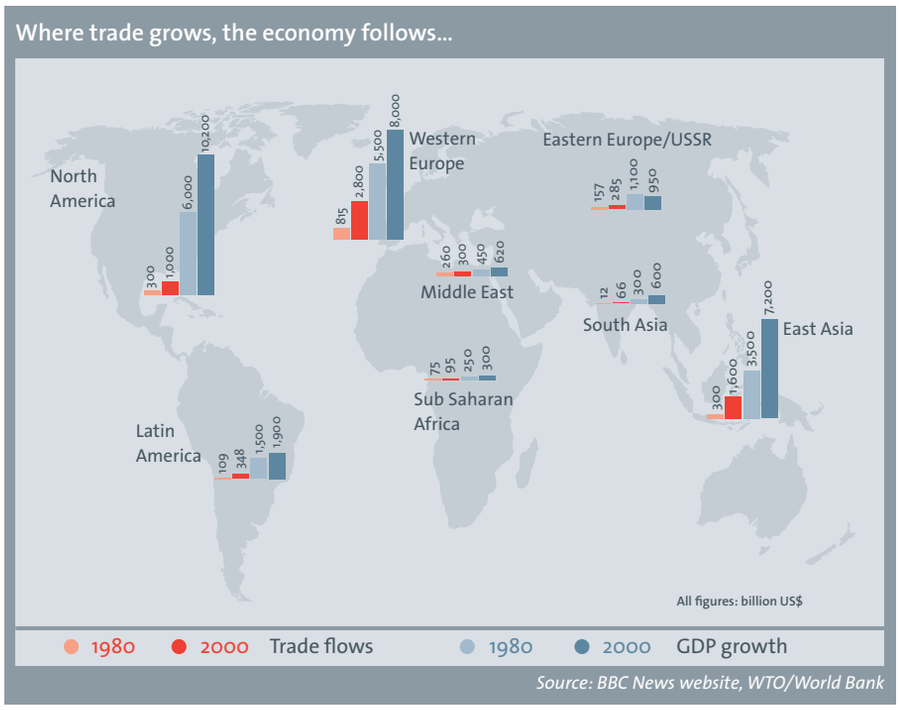
Others

New business models for the use of IP have attracted new players to the scene. The use of patent rights emanating from publicly funded research has led to the formation of Technology (or Knowledge) Transfer Offices (TTOs, such as the Association of European Science & Technology Transfer Professionals),[17] which organise the licensing or commercialisation of research emanating from public bodies like universities. The potential value of under-utilised IP assets has also attracted patent licensing and enforcement companies (PLECs – or 'trolls' to their detractors) which are similar to TTOs, but in the private sector. For some of these organisations, fees from licensing are their only source of income. Patent exchange mechanisms have also emerged and technology markets link potential licensees and licensors.[18] A number of companies now provide online IP buying and selling platforms,[19, 20] in some cases combined with opportunities to license. 2006 saw the first live IP auctions which included the sale of patent rights from some large corporations. And in the financial markets, both patent value funds[21] and a patent index[22] have been developed which effectively bring patents directly into the financial markets as commodities in their own right.

2. GLOBAL JUNGLE

Globalisation has integrated national economic systems through international trade, investment and capital flows and increased social, cultural and technological interaction. It has been a success for some, yet its benefits have not been evenly distributed.[23] Distribution of per capita income between countries has become more unequal: in 1960, the average per capita GDP in the richest 20 countries was 15 times that of the poorest 20; by 2000 the gap had widened to 30 times.[24]





Trade booms, but who wins?[27] World trade has been the engine of world economic growth in the last 50 years. But many poor countries have been left behind as rich countries have subsidised agriculture and blocked access to their markets. The growth in world trade has been unevenly spread. Some developing countries – often in Asia – have increased growth by producing more manufactured goods. But others – often in Africa – have fallen further behind.

Globalisation and liberalisation are accelerating the pace of economic change. Innovation is faster and competition more global than ever before; economies of scale have created an economic, social and political competitive flattening of the world between :

- Countries, regions, hotspots and city states.
- Market sectors, global companies, organisational and business models.
- Consumer markets and workforces.
- Business and universities.
- Cultures.

In the, global jungle, there are many who are ill-equipped to adapt, and safety nets are an increasing luxury. Protectionist measures, such as increased tariffs, or trade restrictions, carry risks.

The key question we ask is: *As the rules of the global jungle take shape, who will survive? And for how long?*

Countries, regions, hotspots

There is growing competition between different geographic regions and hotspots, based on – and for – skills, natural resources, investment and expertise in science and technology. The winners will be those with the right educational, physical and social infrastructure capabilities, as well as the optimum legislation (to ease, for example, the setting up of businesses), financial and tax incentives and adequate economic policies to attract international capital.

But despite globalisation, there are still some strong benefits to clustering. Commerce still declines dramatically with distance and trading remains primarily a neighbourhood phenomenon – which is why hundreds of regional trade agreements (RTAs) have been signed. As the world has divided into trade blocs, these regional organisations play a more important role: they provide countries with more muscle to negotiate international trade terms and enable members to increase the amount of free trade between themselves.

Sectors and business models

Many traditional market sectors and business models are in decline, unable to compete globally or forced to change or relocate in order to remain competitive. Increasing competition provides the incentive for firms to become more mobile, moving to regions where labour costs are low, the regulatory burden the least onerous and conditions ideally negotiable. Consequently, companies are increasingly turning to international expansion and foreign direct investment. Investing abroad may help a company to market a product or services in that country and production abroad can complement production at home. Access to raw materials and new technologies can increase productivity, knowledge transfer and management skills for the investing company in its home country.

Globalisation has also led to increasing trade in service sectors – where these pressures are more acute because there are fewer physical barriers. As Nandan Nikelani, CEO of Infosys, says: "Fifty per cent of global GDP is services, and a lot of that is tradable. The sky is the limit. Everybody has to structure to play this game because price contamination has started. If one company in a sector is doing it, but the others aren't, it'll become more competitive."[25] Another factor is the emergence of global private equity groups (such as Blackstone, which had a $20bn fund at its disposal as of 2006) which scour the globe looking for investment and rationalisation opportunities. Free of stock market scrutiny, these aggressive players can make faster decisions with less regard for some of the traditional stakeholder groups.

The global workforce

There are more workers in the global labour market thanks to the liberalisation of China, India, Russia and Latin America; IT has raised productivity and local autonomy; and innovations in communications have extended the geographic reach of suppliers.[26] In this smaller world, wages in Los Angeles are, in effect, set in Shanghai. Migration of less-skilled workers from developing economies to developed ones to fill vacancies is also becoming commonplace. But movement of jobs is not the only outcome of global competition – the result can be an overall deterioration of wages and working conditions.

The threat of job losses creates competitive pressures even in the absence of actual movement, and many workers may be forced to adapt or obtain new skills. Increasingly 'virtual' companies with little or no in-house manufacturing can shift production between suppliers and different economies with ease. Individuals and economies that can cope well with such changes should thrive on the new opportunities; but those that are unable to do so are likely to find themselves at a disadvantage. "Workers need to be empowered to adapt to constant economic change to succeed in multiple

career paths and to choose periods of self-employment," said a 2000 World Bank paper on the effects of globalisation.[28]

Business and universities

There is no level playing field between business and universities – and in the US, the 1980 Bayh-Dole Act, which encouraged universities to assert and profit from their IPR, has led to growing competition between them around ownership of knowledge. Societal unease about the ethics of certain research, combined with the fact that scientific research is increasingly being conducted outside the traditional centres of innovation, could result in new movements of scientists across the globe. The 'brain drain' – where scientists and engineers emigrate from developing to developed countries – could be replaced by 'brain circulation' – globally mobile researchers working for limited periods in any number of a wide range of countries. They'll work where specific local regulatory controls allow it.

Cultures

'Soft power,' a term coined by Joseph Nye,[29] refers to the ability to shape opinion by means other than coercion or force. It uses an attraction to shared values and the justness and duty of contributing to the achievement of those values as its leverage. So it's dependent on reputation and goodwill towards the proponent. Popular culture and the media are major sources of soft power for the US, for example. Internet-enabled connectivity has heightened exposure to different cultures, and many people now have to decide whether or not to adopt the Western paradigm, whether to selectively choose aspects that are aligned with their values and aspirations, or whether to reject them in favour of their own traditional values and norms. Different cultures have different ideas regarding the environment, knowledge ownership and diffusion.

3. RATE OF CHANGE

There is a growing tension between, on the one hand, the speed of global economic markets, the rate of change in technology and short-term political cycles; and, on the other, the long-term cycles of institutions such as the IP system, as well as human psychology and the environment. The pace of change in the more visible areas actually makes it much harder to find solutions to the slower-developing, longer-term problems such as environmental degradation or climate change. The growing divide between the short- and long-term goals leads us to ask: *How do humans and their institutions adjust to cope with the rate of change?*

Technology avalanche

The speed of technological change is often exponential – Moore's law[30] of growing complexity on integrated circuits arguably remains valid 40 years after its initial predictions, and seems to extend to certain other techno-logical areas.[31] Futurologist Ray Kurzweil thinks that this exponential growth applies to the overall speed of technological change and asserts that the rate of technological development is doubling every ten years.[32] Technological diffusion – the rate of adoption of innovation – is also accelerating. While the telephone took 50 years to be adopted by a quarter of the American population, the mobile phone took just seven years to achieve the same level of diffusion. Product cycles as short as one year are now the norm in many industries. Technologies are adopted in many places across the world at once now.

But, like plant monocultures, this more homogenous technological world runs a higher risk of being 'infected' (either by breakdowns or malicious actions such as computer viruses), potentially causing huge damage. Edward Tenner argues that technological diffusion will lead to 'revenge effects,'[33] unforeseen consequences[34] that are not just a trade-off or drawback for society, but a tendency to cancel out the reason for the technology in the first place – a problem more prevalent with today's emerging technologies than ever before.

Many people see the new capabilities of information and communications technologies (ICT) as enablers of unhindered instrumental power.[35] A report of the International Telecommunication Union (ITU)[36] says ubiquitous network connectivity is forming an additional cyberspace layer atop the physical world. This fundamental interconnectedness allows financial markets to process billions of dollars of trades in seconds, enables virtually instant switching from one set of values to another, from markets to markets, currencies to currencies. It increases the complexity, size and, ultimately, the volatility of global financial markets around the world.[37]

Institutional and human inertia

Institutions tend to be ill-equipped to adapt to change,[38] partly because most societies are still rooted in vertically-aligned organisations driven by bureaucratic logic. Such hierarchies tend to resist more adaptive, yet less accountable, horizontal networks that have the potential to leach resources – time, money and people – without the necessary clearance from above.[39] There are some that argue that a form of de-institutionalisation is taking place, with an increasing reduction of the role of institutions in structuring, mediating or representing democratic processes. This vacuum has enabled both positive and negative (and sometimes criminal) networks to take hold.[40] Various ways to improve institutional inertia in the face of change have been proposed. Stuart Kauffman, professor at the University of Calgary argues for the introduction of patches – various levels of local autonomy to simplify the management of complex global institutions.[41] Such organisations will achieve adaptability through mutual adjustment via feedback loops, receptiveness to new information and a clear view of the common purpose.

The human mind is also ill-equipped to cope with rapid technical, societal and ecological changes.[42] Philosophers like Martin Heidegger have said that technology is something that humans will never be able to control fully,[43] creating a 'risk society.'[44] Professor Paolo Virilio adds that the lack of societal control over the relentless advance of technology is one of the major threats to democracy.[45] In the face of extreme change, human beings tend to respond with the avoidance of 'cognitive dissonance,'[46] a tendency to disregard new information[47] and to defend previously held beliefs.

That's becoming a critical failing. Scientific projections suggest we have only experienced the earliest stages of a growing environmental crisis.[48] The amount of ingenuity needed to handle this problem will be huge,[49] and at the moment there is a gap between the innovation required and what's currently emerging. In other words, there is a mismatch between the timescale of ecological change and our ability to cope with these changes.[50] So while technological advances appear to be uncontrollable due to their speed, they may also be too slow to cope with the problems that mankind will be confronted with in the future.

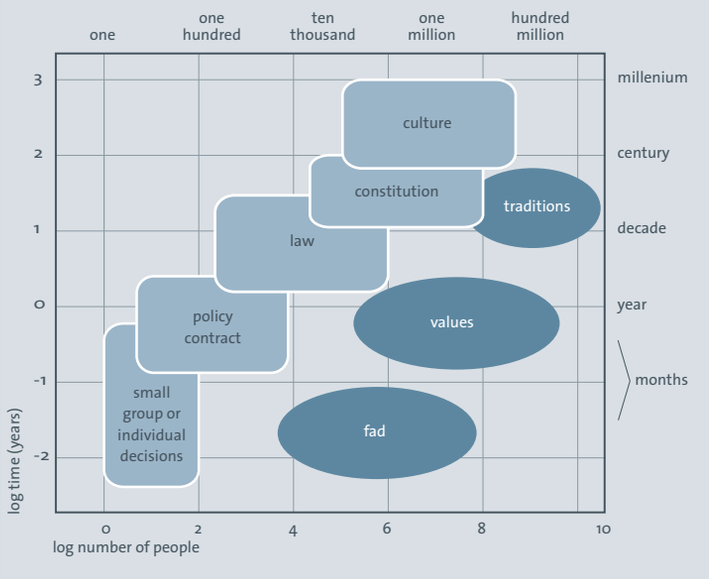
The IP system

The internet has increased the speed and reduced the cost of distributing ideas. The number of former 'outsiders' who have joined knowledge creation and distribution networks has increased the size of the 'global brain' by two-thirds since the early 1990s. So the pace of innovation in the 21st century is likely to be unlike anything previously witnessed. But this acceleration of innovation has not been matched by change at the IP institutions. Pendency times (the period from filing to grant of a patent application) are generally high in all patent offices. The Paris criteria (reduction of pendency time to three years)[51] are often not met. This fast-moving world, with its avalanche of new ideas, means the IP system needs to face up to some huge challenges.

4. SYSTEMIC RISKS

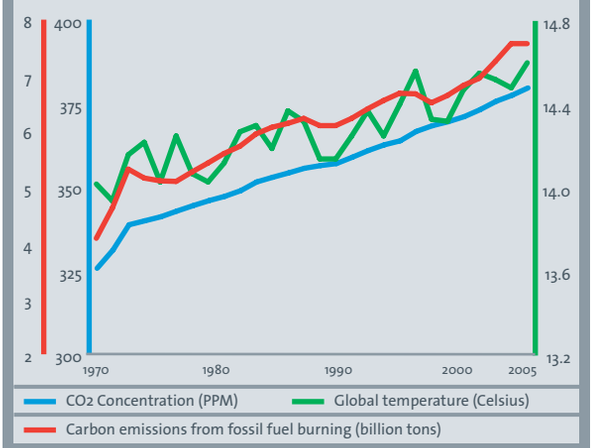
International flows of finance, people, goods and ideas have created unprecedented global interdependence. There are also large-scale risks created by our dependency on the complex natural and man-made systems that support modern humanity, and it's likely that this dependency will increase over the next 20 years.[52] The very nature of these risks is changing, moving more from traditional risks such as natural hazards to complex systemic risks, created by the multiple stresses and uncertainties that together could threaten the integrity of interconnected systems, whether they're economic, social or environmental. And increased population pressures have given rise to a number of regional, ethnic and cultural conflicts, the rise of worldwide terrorism and, last but not least, the increasing impact of environmental problems.[53] This leads us to ask the question: *As global society becomes increasingly reliant on complex interconnected systems, where are the tipping points that threaten them?*

Systems of people and nature



Source: 'Panarchy' by Lance H Gunderson and CS Holling. Copyright 2002, Island Press Reproduction permission by Island Press

Energy and the climate



Source: WorldWatch Institute, Vital Signs 2006-2007, www.worldwatch.org

Left: More knowledge, more change: Social systems, like environmental systems, are constantly evolving to better represent the externalities that affect them. However, there is resistance to change, held within the institutional hierarchy of rules and conventions. In contrast to ecological hierarchies, social systems are structured along the dimensions of the number of people involved and the approximate turnover times. In other words, the more people that are part of the overall system, the harder it is to shift institutional habits; and the more easily smaller groups can form and collaborate, the more challenges they will present to the larger society – and more frequently.

Above: New risks demand new solutions: Climate change is now a given: every aspect of human activity needs to adjust to its potential consequences, from mass human migration to resource shortages. How we manage the knowledge that can enable these adjustments is a critical question.

Risks to human needs

Although predicted in the early 1970s (for example, by the Club of Rome)[54] the scarcity of natural resources is only now becoming widely debated. The discussion is taking place at the highest levels – for example, in the *Stern Report*,[55] the EU commission study on climate change[56] and the *Millennium Assessment Report*.[57] New economic powers, with huge populations, are beginning to catch up with the level of consumption practised by Western countries. It's not hard to work out what would happen if consumption and pollution levels of these developing countries reached the levels of today's developed world, with the chief risk being that of worsening climate change. There are critical risks around energy (fossil fuels look unsustainable, nuclear energy continues to pose safety risks and alternative energies require major development), water (wars over its supply have been predicted)[58] and food (agricultural monocultures could lead to unprecedented problems with newly virulent pests,[59-61] global fish stocks[62] and many species[63] are in danger). As human mobility increases, the risk of global pandemics also rises. The known infectious diseases (such as AIDS, influenza and malaria) remain a challenge but new diseases (including those spread by cross-species transmission) might emerge. There's a growing problem with high levels of resistance among such infectious agents, while the number of new antibiotics and antivirals has failed to keep up.[64] The increasing wealth in developing countries will also lead to an increase in lifestyle-related diseases like obesity, cardio-vascular diseases and mental disorders. Healthcare costs in general are increasing, posing a threat to social security systems.

Risks to essential systems

Computer systems now underpin almost all areas of human activity – including finance, politics, the economy, trade, energy, travel and communication. Because they are so ubiquitous, the stability of computer systems (and the networks that rely on them) is crucial for the survival of society.[65] At the same time, security standards and proper documentation in software development (comparable to mechanical engineering or construction standards) are urgently required to ensure failure-proof functioning of systems. Some argue even that our systems have become so complex and closely coupled that accidents are 'normal' and that the systems are now so complex that their errors can be too subtle for human operators to notice until larger problems occur. Many components are so tightly coupled that failures propagate though the system quickly.[66]

Security risks

Globalisation, regional conflicts, religious fundamentalism and continuing inequalities have given rise to terrorism at an unprecedented level. Societies respond to this challenge by increasing security measures, often at the expense of individual freedoms and basic democratic rights. And cyber-criminality poses a threat to the economy – systems are already now under continuous attack by hackers and cyber-terrorists in search of loopholes. Although there has been a significant decline in the number of armed conflicts since the end of the Cold War,[67] many areas of the world are still beset by wars which may worsen, particularly if certain political systems prove to be unstable.

Ethical risks

Whether it's the development of interfaces between the brain and computers (to enable the control of artificial limbs),[68] genetic testing or genetic selection (now approved by some legislators under some circumstances),[69] technology is challenging our notion of what it is to be human. Techniques for the selection of embryos based on genetic criteria are already available.[70] Future developments could include selection of sex, physical and psychological characteristics and reduced susceptibility to diseases – and cloning.[71] Society has to evaluate the impact of the blurring of boundaries between man and machine, between human and animal – or human to super-human.

5. KNOWLEDGE PARADOX

The very nature and availability of knowledge is changing. Patents have traditionally conferred exclusive ownership for 20 years, but society now questions this monopoly ownership. The rate of technological obsolescence and the clogged IP system make it harder to achieve value from traditional patent usage. And technology now makes information more accessible and counterfeiting simpler, eroding the control a patent holder once exerted. Heavy-handed IPR enforcement is also likely to alienate the public. The transformation of data into information and then into knowledge – information that can be utilised to build capabilities – is also far from being straightforward.[72] This raises the question: *As information becomes increasingly abundant, what knowledge has value?*

Complex issues of knowledge access, search, management, production and ownership force us to question the equation: "more information

The Digital Opportunity Index: major gainers

	Economy	DOI 2001	DOI 2005	Change 2001-2005	Drivers (+.0.2)*
1	India	0.17	0.29	73%	O
2	China	0.29	0.42	46%	I
3	Russia	0.32	0.44	41%	I
4	Hungary	0.40	0.55	37%	I, U
5	Peru	0.28	0.38	37%	O, I, U
6	Indonesia	0.24	0.33	36%	O
7	Brazil	0.32	0.43	35%	O, I, U
8	Poland	0.39	0.52	34%	I, U
9	Japan	0.54	0.71	33%	U
10	Venezuela	0.32	0.43	33%	U
11	Chile	0.40	0.52	32%	U
12	Egypt	0.29	0.38	32%	I
13	Rep. of Korea	0.60	0.78	31%	U, I
14	Israel	0.50	0.66	31%	U
15	Spain	0.47	0.61	28%	U
Average		0.37	0.50	37%	
40 economies		0.43	0.54	27%	

*O = Opportunities I = Infrastructure U = Utilisation

Source: World Information Society Report 2006. Reproduced with the kind permission of ITU.

Catching up fast: the digital tigers
Although the developed economies in North America and Europe have taken the lead in realising digital opportunity, many other states have invested heavily in infrastructure, increasing the number of mobile and internet subscribers. The digital opportunity divide is shrinking across the world, and while there are still major gaps, there have also been major gains. These gains are particularly evident in the BRICs countries – Brazil, Russia, India and China.

The Open Source revolution

Open Source: Open source projects are based on collaborative innovation: large, complex systems are built, maintained, developed and extended in a non-proprietary setting where many dispersed developers work in a relatively unstructured way without financial compensation. Such systems are based on a bottom-up organisational structure[85] and have resulted in popular products such as Apache, PHP, Mozilla Firebird and the Linux operating system. Open source models are increasingly tried out in other technical fields like biotechnology.[86] The success of open source has led to investment in new business models offering advertising, add-ons or services associated to collaborative creations.[87] Some companies have even taken these concepts to a further stage by making open innovation an integral part of corporate culture.[88]

Open Science: The free collaboration and rapid public disclosure of results with no restrictions on use other than acknowledging the source. Bodies such as Responsible Partnering help set standards for these collaborations.[89]

Open Access: Users are free to read, download, copy, distribute, print, search, or link to the full texts of OA articles. "The only role for copyright... should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited."[90]

Open Innovation: The emerging paradigm for innovation that prioritises partnering, licensing and venturing to combine internal and external sources of ideas and technologies.

Open Standards: Open standards are publicly available specifications that provide a common method of achieving a particular goal. HTML and CSS are open standards, and the popularity of these illustrates the importance of open standards and how they encourage interoperability between hardware and software platforms.

equals more knowledge" and then to ask: *Are there cheaper, quicker methods of protecting and exploiting knowledge?*

Knowledge access

The internet constitutes a particularly dramatic change in the way knowledge is presented, distributed and accessed. It not only provides a new channel of information transfer (like radio, telephone and television did), it also offers new ways of archiving, searching, sorting, classifying, analysing and working with data.[73] But access to information and knowledge is not evenly distributed around the world. The 'digital divide' separates a large part of the world population from the benefits of the internet, although the Digital Opportunity Index (DOI), which rates categories of opportunity, infra-structure and utilisation, shows the gap shrinking rapidly.[74] Ready access to information is creating new forms of on-line communities as well as new reputational risks for both individuals and organisations.

But alongside this greater openness there is now more privatisation of knowledge using intellectual property rights. Some claim that IPRs are limiting access to knowledge and stifling creativity. Approaches such as Open Source, Open Science and Open Standards are evolving in response. Communities and individuals are using these principles to disseminate, as well as access, information – through Wikipedia, blogs and podcasting, for example. Many people have become producers and distributors of knowledge, not just passive consumers.[75]

Knowledge search

The increase in accessible data makes it harder to filter the significant from the irrelevant, the true from the false. In other words, access to information, in many cases, is not the same as access to knowledge. Mavens, trusted experts in a particular field, are becoming increasingly important as a reliable means of sifting through large quantities of information or providing insights.[76] But there are many changes taking place in knowledge search. Information management and retrieval is being improved by new search algorithms, text-mining approaches, image recognition and structured search methods. Using the internet, these are creating a 'semantic web' that could allow for the extraction of not just data, or even information, but true knowledge.[77]

Knowledge management

Knowledge is increasingly being managed in separate packages. For example, many companies are now 'insourcing' information management, synchronising all their systems inside an in-house department to ensure they can effectively mine their own knowledge banks and coordinate effective decisions. Other companies are still outsourcing, reallocating specific corporate functions to a third party, but then reintegrating discrete packages of output data into their overall operations, again to improve self-understanding and improve decision-making. And knowledge management systems – from customer profiling to business process management and financial analysis packages – are helping to formalise knowledge gathering and processing.

Knowledge production

The information revolution has empowered individuals and enabled them to produce their own information in digital formats. This personal power to create, modify and disseminate information has dramatically increased the reach and scale of the individual, and led to a massive increase in the global exchange of digital information. The tools of creation and production are no longer restricted to organisations that can afford expensive hardware; they are available to anyone with a computer. For example, the founders of Google, a company worth US$140 billion less than a decade after its inception, were students when they established the company.

Knowledge in many technical areas, such as software, is now often produced by way of a cumulative or sequential development process, which is characterised by the incorporation of prior knowledge into a new innovation.[78, 79] Knowledge production has also become more multidisciplinary – creating convergent technologies such as the combination of nano-, bio-, and cognitive technologies, underpinned by information-technology (NBIC).[80] According to the report of the National Science Foundation, "the synergistic effect of the three systems will lead to an explosion of new knowledge and new capabilities," resulting in "the computer/communications revolution and the nano/biology/information revolution." There is a growing trend towards internationalisation of research and collaboration between different research organisations,[81, 82] or for R&D under the open source approach. Knowledge production is also subject to cultural differences. The currently predominant analytic-scientific paradigm, with its relentless drive to uncover the secrets of nature, produces a different type of knowledge compared to the more correlative and permissive traditional Chinese[83] approach or the way knowledge is handled by indigenous populations.[84]

Knowledge ownership

Patents and copyright were always based on the notion of a 'natural' right of the innovator to his creation at least for a limited period of time, a right that provides an incentive for innovation and creative activity. But patents also require the obligatory disclosure of the invention. That creates another benefit, one that accrues to the public. Now, due to the cumulative, multidisciplinary and collaborative innovation process, ownership of knowledge in many technical fields has become highly fragmented. That means that the use and diffusion of knowledge have become increasingly impeded, threatening the concept of new inventors 'standing on the shoulders of giants'. Even if this blockage is somewhat alleviated by the possibility of cross-licensing or the so-called research exemption on patented subject matter and 'fair use' exemptions in copyright law, that fundamental sharing of benefits offered by patents is under threat from modern IP ownership practices and enforcement of IPRs.

Coming back to the "more information equals more knowledge" equation: *If the rules around access, management, production and ownership of knowledge are not chosen properly, more information could even equal less knowledge – and less innovation. This is the knowledge paradox.*

CONCLUSIONS: THE NATURE OF DRIVING FORCES

With these five different pressures combining to affect an IPR system already under strain, how might IP regimes evolve by 2025? What legitimacy might such regimes have?

This dynamic, unpredictable world has no precedent. The blurred boundaries have created the one other element we identified: the Kaleidoscope Society. This is fragmented, interconnected, has multiple identities and develops in new directions as dramatic demographic shifts take place. A kaleidoscope denotes constant change: a "delightfully diverse and unpredictable sequence of sights and events." Within the context of such complexity and turbulence, the ability to navigate reflexively and to adapt will be critical.

Together with the input provided by our many interviewees, we have developed four scenarios, each one with its own characteristics. From the world of today, the patent system could evolve in one or a combination of these four directions, depending on how the driving forces play out. These scenarios are shown above.

RADICAL SHOCKS

During the course of our scenario building exercise, we accounted for the possibility of several radical shocks – economic, political, health or environmental – that could have major impact on the trajectory of the future. Although our scenarios make allowances for major change, we have not included the likelihood of catastrophic events such as meteor strikes or major global wars ■

The four scenarios

Market Rules – Business as the dominant driver

The story of consolidation in the face of a system that has been so successful that it is collapsing under its own weight; Power and Global Jungle are the major driving forces.

Trees of Knowledge – Society as the dominant driver

The story of erosion in the face of diminishing societal trust, where Power (from the bottom up) and societal fear of Pace of Change and Systemic Risks – and Knowledge Paradox (in terms of access and control) – are the major driving forces.

Whose Game? Geopolitics as dominant driver

It's the story of conflict in the face of changing geopolitical balances and competing ambitions, where Power and Global Jungle are the major driving forces, but in contrast to the business-led scenario, the states are the key players.

Blue Skies – Technology as dominant driver

The story of differentiation in the face of global systemic crises, where Pace of Change, Systemic Risks and Knowledge Paradox (as the nature of knowledge changes) are the major driving forces.

Kaleidoscope Society

Fragmentation
The world is not static. We can already see a fragmentation of society occurring at many levels. **Individualisation**[1,2] and **urbanisation** in many parts of the world have led to the decline of traditional forms of living, such as extended families and small communities. UN Habitat, the UN Human Settlement Program, says that by 2030 there will be two billion new city dwellers, many of them living in slums.[3] **Economic** fractures split societies into haves and have-nots – a division particularly marked in emerging countries with fast economic growth, but also in developed countries that are having to adapt to an increasingly competitive global environment.[4] While some regions of the world catch up others are notoriously left behind.[5] **Education** in many parts of the world, including rich countries, is still strongly correlated to income and thus reinforces the divisions.[6]

Ecological problems will most drastically affect parts of the world that are not themselves responsible for causing them; vulnerability to climate change is a factor of exposure, sensitivity and adaptive capacity.[7] **Cultural** and **religious** differences appear to be hard-wired and seem to resist simple 'globalisation' fantasies.[8] **Terrorism** fuelled by regional conflicts and global inequalities is likely to remain a fact of life.[9]

Interconnectivity
At the same time, the world has become smaller – and maybe flatter. **Information** and **communication** are ubiquitous thanks to the internet; censorship is getting more difficult; and basic **human rights** are claimed in all parts of the world. Inequalities are no longer simply accepted: people in disadvantaged regions increasingly demand their share, seeking it through **migration**[10] or fairer conditions of **trade**.[11]

Demographic transition
Shrinking and **aging** populations in many developed countries – caused by falling birth rates and increased longevity – will shift the economic burden increasingly onto the young in many regions.[12,13] The resulting need for a rejuvenated workforce will probably lead to massive **migration** in the next few decades. According to the World Economic Forum, the EU will experience a significant decline in its working-age population over the next 30 years.[14] But in India, the number of working-age people will increase by 335 million by 2030 – almost as much as the total working-age population of the EU and the US combined in 2000. This kind of rapid demographic change suggests ethnic and racial conflicts are likely to escalate.[15]

It's not just the West: in China, which lacks a well-established retirement system, demographic change could lead to huge social conflicts.[16] **Gender** imbalances caused by traditional prejudices, but also helped by new reproduction technologies, could exacerbate the problem. And in Africa, hollowed out societies might struggle to fill the gaps left by the ongoing AIDS epidemic.[17]

Left: Female employee at a strawberry greenhouse, in Palos de la Frontera, Huelva, southern Spain. Around 30,000 immigrant female employees have been recruited in eastern European countries for the picking. Photo: Samuel Aranda/AFP/Getty Images

The Oracle was well-known throughout the land as the most reliable source of information. It specialised in helping people make the right decisions about their trade. So, when a tanner had a new idea for his leathers, or a farmer a new crop, or a blacksmith new bellows, they would visit the Oracle, make an offering and ask whether it would work. And the Oracle was fair – if asked about an idea that someone else had already, it would suggest trying something else.

But the Oracle guarded its powers jealously and would not share its secrets with anyone. Pilgrims would travel for days to ask their one question in person. And when they returned to their own villages, they always caused a stir. They found that they started to get more work than their neighbours. So their rivals started to come up with ideas to put to the Oracle too.

Because everyone who visited the Oracle did well, more and more people were drawn to the cave and soon the small camp outside started to grow. Unfortunately it also attracted hawkers and traders – and even thieves and beggars. But still more people came. And as the numbers swelled, the priest who tended the Oracle had to hire new acolytes to help. One day, a quarryman asked the Oracle about an idea he had for using stone on bridleways. The Oracle told him what a good idea it was. So the quarryman started building…'roads.'

Suddenly it was easier to reach the Oracle – people could do it in hours rather than days – and, soon, the encampment had become a large community. Guildsmen from all over would bring coaches full of serfs and send them in one after the other to ask questions about their master's work. Quarrels broke out about the queuing system and some of the smaller artisans started to get disheartened about ever seeing the Oracle, while the priest recruited ever more acolytes to help.

The priest was becoming nervous. The Oracle was struggling to keep up and didn't have time to give each pilgrim the attention he deserved. In fact, the Oracle was wearying and making small errors. What if its judgement began to fail under the pressure? One of the acolytes suggested the pilgrims might have to restrict access to the Oracle or offer a larger offering – or close altogether and force people to decide for themselves.

The people raged at the priests: "Why can't the Oracle work harder? Why is there only one Oracle?" Some of them had heard of wise men in other lands. Wisdom is valuable, but not at any price and, if the Oracle couldn't answer all their questions, why wait for nothing?

The priest scratched his head. "I'd better ask the Oracle," he said…

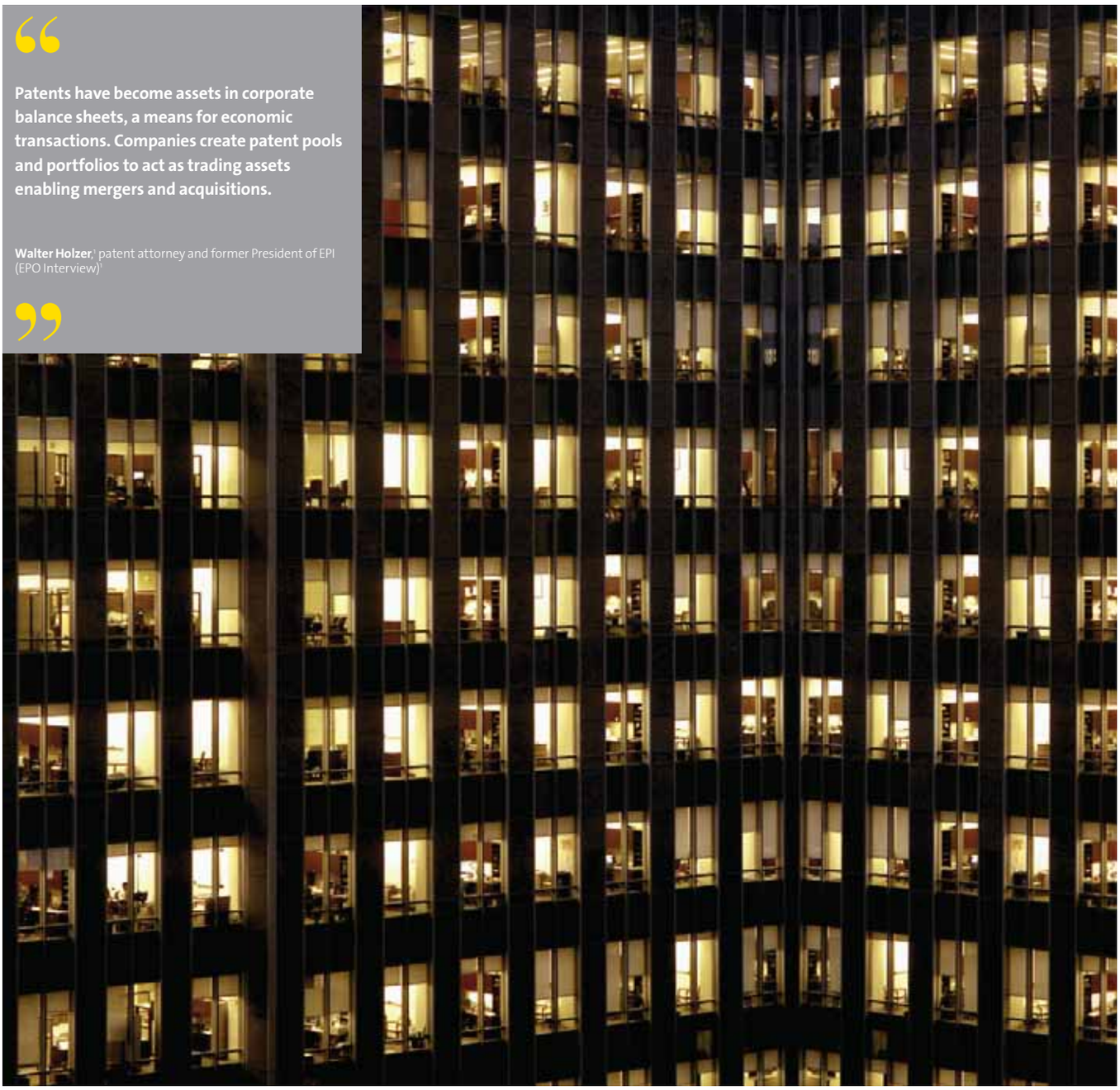
Moral: It is better to bend than to break.

MARKET RULES

MARKET RULES

The story of consolidation in the face of a system that has been so successful that it is collapsing under its own weight; Power and Global Jungle are the major driving forces.

The evidence that points to this scenario is...



> **Patents have become assets in corporate balance sheets, a means for economic transactions. Companies create patent pools and portfolios to act as trading assets enabling mergers and acquisitions.**
>
> **Walter Holzer**,[1] patent attorney and former President of EPI (EPO Interview)[1]

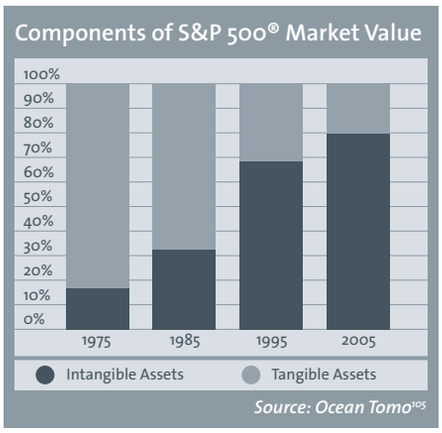
Although patents and other forms of intellectual property rights (IPR) have many functions, their primary application is to allow innovation to be exploited and products or services to be brought to market in a way that justifies the investment in them. Patents give companies rights which are, in most jurisdictions, otherwise prohibited in exchange for making their innovations public. But unfettered competition is considered by many as essential to achieve optimum prices and the quantity and quality of goods and services, and hence there remains the need to balance patent and competition laws,[2] the marriage of "the innovation bride and the competition groom."[3]

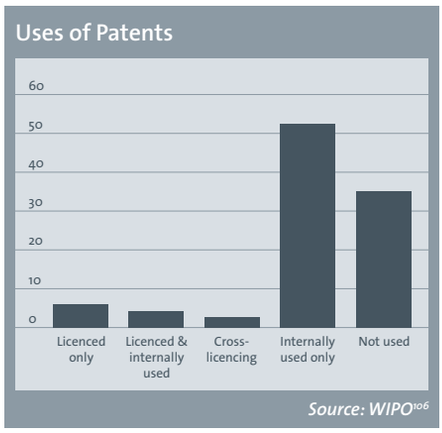
Innovation and products are, however, now produced and marketed worldwide. "Business is becoming increasingly borderless and consumers are less and less concerned about the national origin of the products they use," says Hisamitsu Arai, Secretary-General of Intellectual Property Strategy for the Cabinet Secretariat of Japan. "Whilst Japanese companies used to apply for patents in Japan only, now they are increasingly producing products for the international market, and need a system that meets their needs and provides them with certainty at the global level. The forces of globalisation require a borderless patent system."[4]

Businesses rely on IPRs – so they want predictability from the system and there is too much money and strategic advantage at stake around patents for them not to need a working IPR regime. But that pressure from globalisation means the original territorial system of national patent offices is starting to look less capable of meeting those needs. And, perhaps most importantly, pressure from a huge increase in the number of patent applications (and a perceived decline in patent quality) is making the system creak at the seams.

Business is evolving

Outsourcing – allowing other companies to take over part of the value chain – also changes the purpose and value of patents. Where, once, companies asserted patent rights in order to protect their investment in the capacity to invent and manufacture against local competitors, in 2007 they now see those rights as a fundamental part of their enterprise value even if they don't manufacture anything themselves. Intangible assets consultancy Brand Finance estimates that physical assets – property, plant and machinery, stock – now represent just 38% of the value of the world's publicly traded companies (intangible assets are US$19.5 trillion of US$31.6 trillion in global market value).[5] Others claim 'tangibles'





Far left: Intangibles: the new value creators. Growth in service industries, the power of global brands, the explosion of IP registrations and the development of more sophisticated valuation techniques has seen the proportion of the market value represented by physical assets decline markedly.

Left: Heading for a tipping point. As of 2004, says WIPO,[8] the vast majority of patents are either not used at all or only for internal manufacturing purposes. But as we'll see later (page 37), the trend is for fast growth in licensing and sales of IPR. This kind of shift represents a challenge to an IPR system set up to cope with the kind of monocultural situation this graph represents.

are as little as 20%. Brand, goodwill, know-how, human capital and relationships form a sizeable chunk of that intangible value, but IP is also a critical component.

So business now sees patent rights as a financial asset as well as a right to a potential monopoly. The biggest companies, with the largest portfolios of patents, deploy armies of researchers, accountants and lawyers to evaluate opportunities around the exploitation of their patents. And they understand that the value of these assets is dependent on a workable system of regulation that is, in fact, already overloaded.

Why business loves patents

This isn't a straightforward question of making the system, as originally designed, work better. Businesses have a variety of reasons for seeking patent protection or rights, whether that's on internal innovation or acquired patents,[6-7] and those motives evolve over time. Today, typical reasons include:

- Provisional protection of an innovation by having pending applications.
- Building monopoly position.
- Blocking others from entering a market.
- Assembling a portfolio of rights to create financial strength.
- Getting a seat at the table when standards are being set.
- Creating marketing messages and becoming more visible in a market.
- Generating licence income.
- Building a base for infringement claims (becoming a 'troll').
- Preventing lawsuits.
- Measuring the performance of the company or individuals.
- Communicating innovativeness to investors.
- Or even to avoid the feared, but unknown, consequences of not patenting.

These can be grouped into six main motivations for patenting: commercial exploitation; licensing; cross-licensing; prevention from imitation; blocking competitors; and reputation. There are also six main categories of 'uses' of patents:

Below: Audi's recent A6 ad campaign claimed: "To date, NASA has filed 6,509 patents. In developing the A6, Audi filed 9,621." Here, patenting has been sold as proof of innovation.[9]

internal; licensing; cross-licensing; licensing and using; blocking competitors; and not using.[10]

Clearly, many of the motivations for patenting are purely defensive – in short, the argument runs, "we invested in this innovation, we earned the right to exploit it." But in the 1980s, there was not only a steep rise in the number of patent applications (see overleaf) – there was also a shift in the reasons companies sought them. For example, as Japanese companies ramped up production of memory chips, US corporations such as IBM, Bell Laboratories and Texas Instruments realised that they held valuable non-core IP assets related to that market. Although they might have obtained patents as part of managing R&D activities, or sometimes, it was said, because engineers "wanted the patents on their CVs," these accumulated patent portfolios enabled them to file infringement suits and win some large settlements. "The large damages awards that have been handed down in some cases have caught the eye of both company boardrooms and shareholders," says Joff Wild, editor of *Intellectual Asset Management* Magazine. "This helped to move patents closer to the centre of business planning."[11]

Once it became clear that patents could be valuable in themselves – not just as a means of protecting your own operations – the game changed. "This was the emergence of a proto-typical 'patent arms race' which, symptomatically, came to replace the race to be first to enter the market and gain the first-mover advantage," says Professor Paul David of the University of Oxford and Stanford University.[12] "Emblematically, it was a far cry from the idea of the 'patent race' in which rival firms sought to pre-empt a dominant market position by being first to invent."

New players emerge

As the scramble to realise and secure value in the patent race has intensified, there is a growing division of the knowledge value-creation chain. Many new intermediaries have become involved in the valuation, protection and exploitation of patent rights, each having their own competence.

Specialist agents now provide advice and support in securing financing for IP (via government support, private equity, the public markets or debt), the marketing or trading of patents, or simply advice on patent strategy. Technology development companies such as Intellectual Ventures, the investment firm led by former Microsoft CTO Nathan Myhrvold, licensing companies and university technology transfer departments all have a hand in helping companies exploit patent rights.

But of all the new players, the activities of the so-called 'trolls' have been the most controversial.[13] Trolls take the portfolio approach a bit further: they use patents only as leverage for licence or infringement claims. In some cases these rights owners may allege infringement by a large number of companies, even across an entire industry or market, and seek to achieve a financial settlement with each, such as via a licensing agreement. (Although no official definition of a troll exists, an alternative and less derogatory term for these 'purely patents' businesses is a PLEC, a patent licensing and enforcement company.) So the system has not evolved purely benignly as far as business users of patents are concerned.

The rise and rise of patenting

The global increase in the number of inventions entering the patenting system[16] and the increased use of patenting around increasingly complex and granular innovations means the system is, in some ways, a victim of its own popularity. A higher number of applications increases pendency; and higher stakes (thanks to business getting smarter at using patents, and now having channels to profit from them even if they're not using them themselves) is making costly litigation more problematic, as we'll see later.

Although for many businesses quantity is the key to a successful IPR strategy (as the claims in the recent Audi A6 advertisement show), maintaining quality in the face of ever-increasing quantities of applications creates difficulties for the patent offices – a fact that is causing concern among both patent experts and businesses. "If the system is driven in the direction of more quantity and no maintenance of quality, it will lead to an imbalance, and will eventually lead to the collapse of the system," says Francis Ahner, Président of the Fédération Internationale des Conseils en Propriété Industrielle. "The European patent has been the victim of its own success: quantity has had a negative effect on the ability of the system to continue."[17]

The numbers game

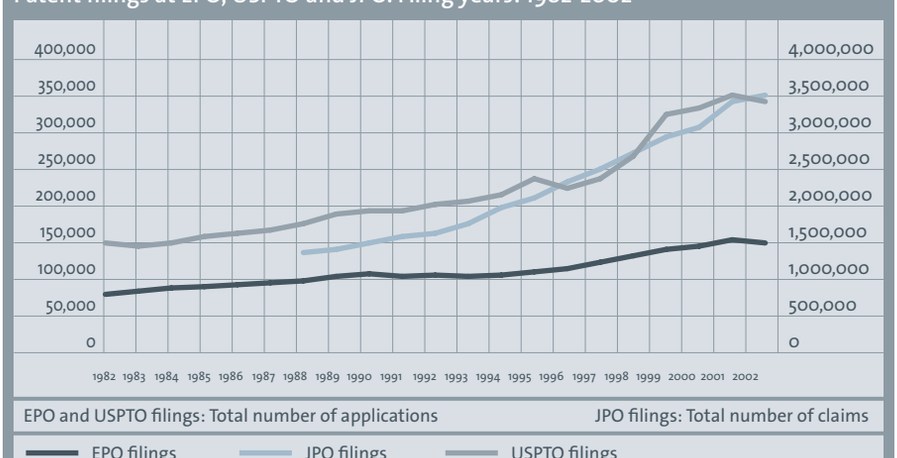
Although in the past only very large companies might have thought of themselves as 'global,' the requirement for this kind of reliable, world-wide IP protection now affects small and medium-sized enterprises (SMEs, which under the standard EU designation means between 10 and 249 employees with some turnover limitations). WIPO member states recognised as much when they introduced a focused programme in 2000 to support SMEs with regard to IP.[18]

At the EPO, of the 34,200 separate applicants who filed in total about 185,000 applications in 2005, nine out of ten were 'small applicants' – chiefly SMEs – who typically file between one and five applications per year.[19] But a study by the Danish Government found that SMEs in the EU were making very little use of patents because of difficulties in monitoring whether infringement is taking place and because of a fear of the cost of litigation to assert patent rights. In other words, they like the idea of the system a lot; but it's hard to work through the practicalities.

SMEs say that the cost of patent disputes is too high in terms of time as well as money.[20] An EPO Public Hearing for SMEs[21] found similar concerns, as well as lack of timeliness (especially

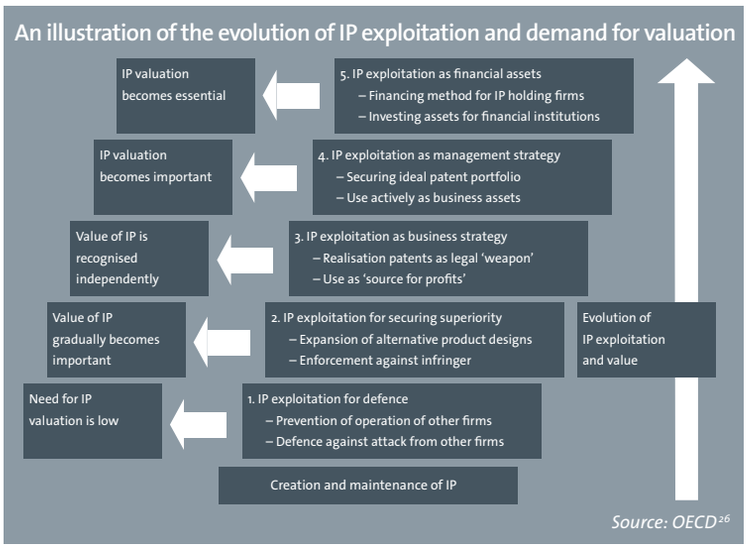
> **The current world backlog stands at over 10 million unexamined patents. However, there is a lot of redundancy within the current system and it needs to be addressed, because many of these 10 million patents have no certainty of legal protection and the technologies could otherwise be available to the market.**
>
> **Jon W Dudas,** Under Secretary of Commerce for Intellectual Property and Director of the USPTO[15] (EPO Interview)

Patent filings at EPO, USPTO and JPO. Filing years: 1982-2002



Source: OECD Patent Database and USPTO, EPO and JPO Annual reports. JPO figures for 2001 and 2002 are OECD estimates

Above: A victim of its own success.
The massive, and relatively recent, growth in patent applications[14] is motivated at least in part by the new understanding about the value of IP – as well as accelerating innovation, particularly in the ICT, biotech and emerging converged technology arenas.



Above: Why patents get more valuable to business
Over time – and the progression is applicable both to a company's own development and the recent history of business in general – IP gets more highly valued. Knowing where to find it, how to control it, how to defend it and how to maximise the financial rewards from IP becomes increasingly important.

How to value a patent

There are many methods for valuing IP including qualitative evaluations that vary significantly depending on, for example, who the owner or user is – so they're not an absolute value.[23] Quantitative methods include:

Cost: Work out the development or replacement cost for a given invention.
Weakness: not correlated with the future value of the asset.

Income: How much revenue does the invention or its associated licences generate?
Weakness: subjective valuation of future cash flow relies on accurate analysis.

Market: Compare IP assets to similar ones already valued.
Weakness: suitable comparisons can be hard to find and the data difficult to access.

Value indicators: Look at backward and forward citations or litigation to identify importance of patents.
Weakness: not suitable for newer innovations.

Option pricing: Work out the value of the IP as you would an option in a financial market.
Weakness: very complex.

Current data[24] shows that between 30% and 45% of companies in Western Europe employ valuation techniques, while in Japan this figure is slightly higher at around 50%. But the percentage of major companies' values which are attributable to intangible assets, including intellectual property, has risen to as high as 80% by some measures.[25]

for short life-cycle products), complexity and lack of institutional support. "Criticism now also comes from within industrialised countries, and often the small and medium-sized industrial users of the system," says Dr Roland Grossenbacher, Chairman of the EPO Administrative Council and Director of the Swiss Federal Institute of Intellectual Property. "It centres on several issues: too high a level of patent protection and too low a threshold. [This] has led to such a flood of patents that the sheer quantity hinders spontaneous innovation, exacerbated by the unnecessary complexity of the administrative system which precludes the smaller players."[22]

Worse still, some of the problems with the current regimes – such as patent thickets and trolls – work doubly against smaller businesses. For a large company, the biggest value is often derived from the ownership of a patent portfolio, covering many marginally different aspects of single technologies, that has a higher chance of containing a right that another player will infringe. Microsoft's Corporate Vice President and Deputy General Counsel, Intellectual Property, Marshall Phelps, offers an analogy for the imbalances that creates between large and small companies:

"Here is how an actual licensing negotiation might go. Please excuse the horrible analogy, but take it for what it is. You walk in and you basically compare your coal pile with your adversary's. Then you might say, well, that is pretty impressive or perhaps mine's bigger than yours. However, at the bottom line, if you can show that on top of your sheer superior quantity of carbon you also have one or two actual diamonds, you can really begin to make an impression on him. These negotiations can typically take a year and a half and you eventually come out agreeing that the quality and/or quantity of his coal pile is better than yours or vice versa, and you devise a payment schedule that reflects a fair comparison. I must be honest and tell you the process is highly imprecise, but it happens all the time."

To extend the analogy, the larger your sack of coal, the more chance there is that there's a diamond in there. And, even if there isn't, the probability that there might be, makes the negotiation more likely to go your way.

IP values require reliable IPR

And now that businesses are trying to attach explicit valuations to their IP portfolios, their reliance on the system is far higher than it was, say, 40 years ago. According to IBM, "A hallmark of a properly functioning marketplace is that there is a clear way to determine the fair price of the assets being bought and sold… IP is an important asset in the knowledge-based economy. However, due to its intangible nature, we have limited capability to reliably ascertain the value of IP assets." The IPR regime is, in effect, the market regulator (the SEC or FSA) in this analogy.

Of course, it's not just about finding the exact value of an individual patent. Just understanding that a patent has a value is a critical driver, pushing business to seek more from the patent system that, effectively, acts as the creator of that value. "If something is perceived to be valuable, then people will find the money to protect it," says Prof Michel Santi of the Department for Strategy and Business Policy at the HEC School of Management in Paris. "If we keep asking for more protection and lower fees, then the patent system will be used as a business 'game,' just for the fun of increasing the number and size of entry barriers. The system is running in the wrong direction, being pushed by politics. It needs quality, not quantity."[27]

But methods for assessing the value of the IP are neither widespread nor consistent.[28] Some apply a monetary value to each patent; others are based on forward patent citations, on a composite indicator, on the probability of getting a patent granted, on patent opposition and renewal data, on requests for an accelerated examination process by the applicant, and on whether a high-tech start-up has been created on the basis of a codified invention.[29] "There are almost as many potential methodologies to approximate the value of patent as the number of existing investigations," it is claimed.[30]

Valuation techniques[31] divide primarily into two groups: qualitative (rating patents based on the scope and certainty of the rights); and

quantitative (calculating a monetary value). Such valuations are needed for a variety of reasons and by a variety of players. Company management use them to decide IP strategy, calculate royalties and value assets in M&A deals. The judiciary can use them for assessing damages in litigation. Some banks in Japan and Germany are now offering to accept individual (or a portfolio of) patents as collateral for loans; others use them to assess the value of new companies whose only assets are IP rights. And investors, of course, look at IP values to evaluate potential investments.[32] Awareness of the potential financial benefits has encouraged companies to be more active in exploiting their patent rights and this has led to a large increase in licensing.

Pressure to rationalise

Businesses love efficiency – in their own operations, in the markets in which they operate and in the legal systems that regulate them. The business world, which would be happy to treat IPR regulation as a 'black box' system requiring little knowledge of its inner workings, wants the IP regime to be simpler – as well as being more reliable. "It is increasingly difficult to accept that, in order to achieve global protection for the same invention, it has to be dealt with by a number of different patent authorities, all paying large numbers of skilful and expensive examiners to undertake the same task," says Professor Joseph Strauss, Director of the Max Planck Institute for Intellectual Property, Competition and Tax Law in Munich. "The outcome may then vary, either slightly or dramatically, or even be a total failure in one region; but it always costs companies a lot of time and money. Rationalisation is the main task for the future, as the current situation is simply not justifiable."[33]

Traditionally, the three main patent systems are the USPTO, the EPO and the JPO, which form the Trilateral Group. They currently differ from each other in some significant ways, which makes it much harder for companies to register patents globally. The three offices are, separately, the subject of moves to rationalise their practices. Elsewhere, Japan and South Korea have introduced a patent examination highway that will make applications more convenient for filers, and the Commissioners of South Korea and Japan have already agreed to accelerate mutual patent cooperation and to find a solution for integration of their patent systems with China.[34]

"There are different options for harmonising and reducing redundancy," says Jon Dudas, Director of the USPTO. "For example, if we can make the laws regarding patenting more similar then it could be possible to file only once, and remove the need to do this country by country, each with its own separate set of lawyers. Another concept would be to permit a first filing anywhere in the world to be used as the basis for a second filing. It is possible that the search process, the filing process and the formalities could all be streamlined."[35]

The process of rationalisation is already starting to take place. "One need only look to Singapore, Australia, Mexico and Canada to see the steps they are taking to align themselves with the general strategies of the major offices," says Brad Huther, President and CEO of the International Intellectual Property Institute. "This heralds a collective and effective transition to a future state, where cost-sharing arrangements between offices can be made, with resultant lower operating costs."[36] In 2005, the USPTO started a programme to outsource prior art searches to private companies and even other national patent offices[37] – in January 2007, it agreed to "extend a project under which IP Australia provides search and examination services on international patent applications filed with the USPTO under provisions of the Patent Cooperation Treaty (PCT)."[38]

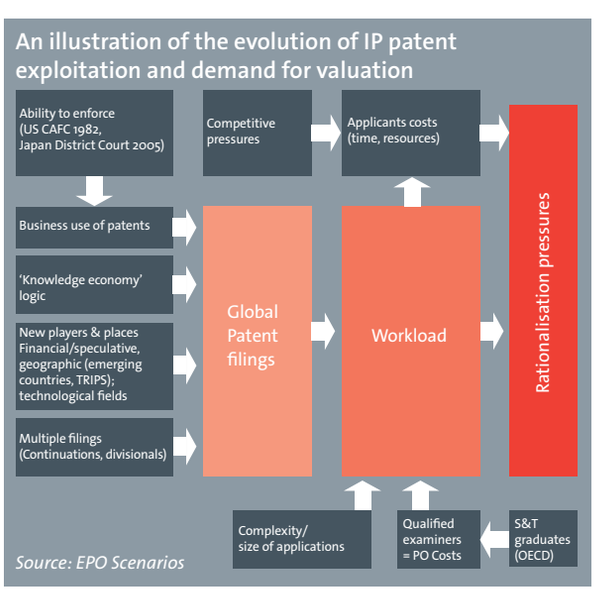
The drive for rationalisation is not only taking place at global level. In October 2006 a European Commission report[39] concluded that Europe urgently needs a clear and coherent legal framework for patent protection fit for purpose in the 21st century with a focus on quality, affordability, convergence (to enhance legal certainty[40] and reduce costs), and balance (between rewarding valuable creations and ensuring that ideas can circulate easily in Europe's dynamic information society).

Barriers to a global system

But although the business community – and in

Above: Apple iPhone High-tech products are globally produced and marketed and thus the subject of a multitude of patent rights under a variety of patent regimes. Source: Courtesy of Apple.

Above: Ramping-up licence income Billions of euros are now at stake for companies licensing their patented IPs, putting ever-greater pressure on the regulators to offer certainty, speed and frameworks for dispute resolution.



Above: The pressure to rationalise The sheer volume of patenting activity and the cost incurred by the regimes' 'customers' means change is all but inevitable.

particular the increasingly powerful multinational corporations (MNCs) – would welcome a more unified global system, it's unlikely to happen overnight, "owing to political constraints, such as the belief on the part of many developing countries that it would constitute too powerful an economic instrument, as well as resistance from some national and regional offices that fear that a global system might deplete expertise at the national level," says Dr Francis Gurry, Deputy Director General of the World Intellectual Property Organization (WIPO). "Everyone needs to be comfortable with a new development in the multilateral system before it can be adopted."

Nevertheless, in a recent *Financial Times* interview, Angela Merkel, German Chancellor and, in 2007, President of the EU and G8, expressed her view that the harmonisation of, at least, the patent systems of the US and Europe will be an important factor in the development of a transatlantic single market.

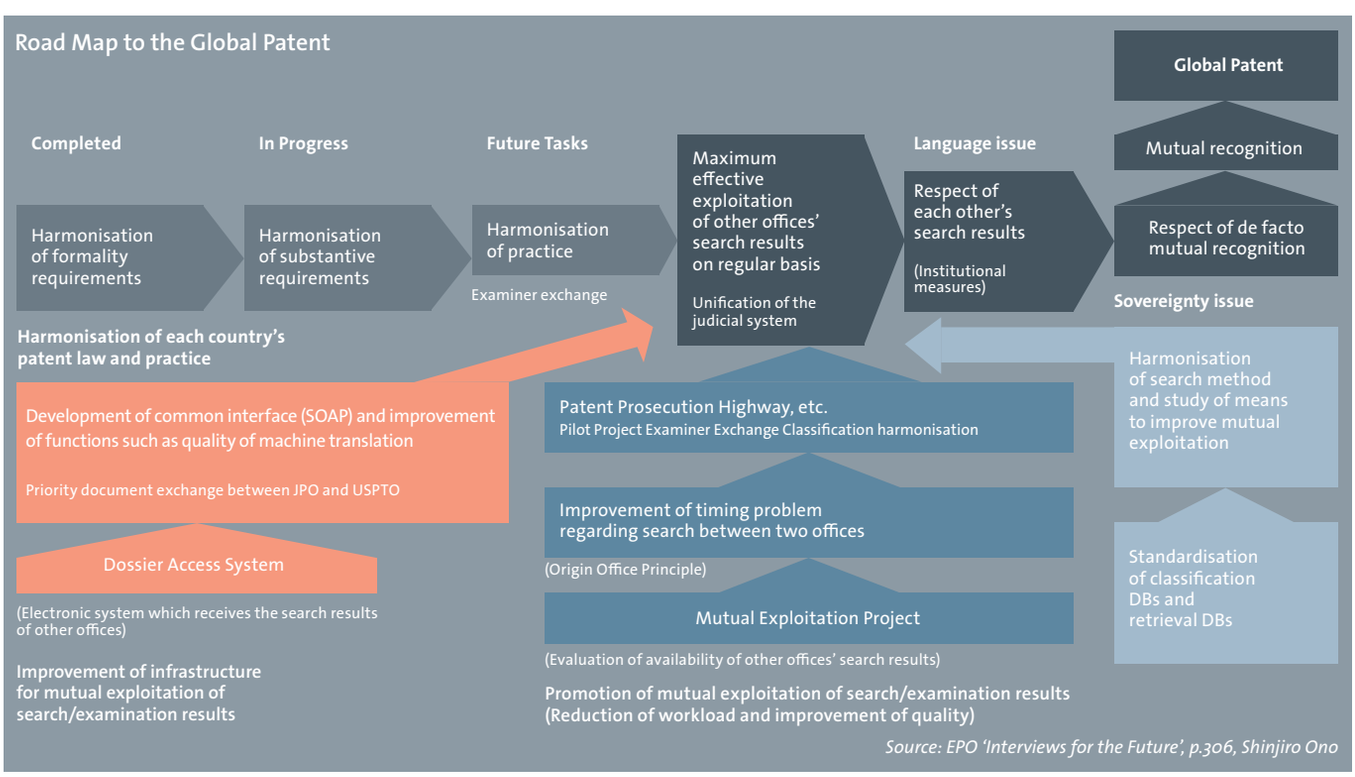
Europe has long faced this sort of problem in microcosm – for example, with its many different languages,[41] a problem that doesn't affect the JPO or USPTO… yet. "In the development of a global patent system, many countries will be affected by the issue of language," says Kazuo Wakasugi, former director of the JPO and now chairman of Japan Petroleum Exploration. "I would like to see a completely automatic translation system in place. We need to develop a common language within the patent world, one that is unambiguously understood."[42] "There is only one way to solve this problem, and that will be to use the English language," says Professor Jean-Jacques Duby, President of the Observatoire des Sciences et des Techniques. "It is easier to fit into computer networks, to speak and write, to express complex concepts in a concise way and to make yourself understood."[43] Which is why the business world already uses it as a *lingua franca*.

Europe also faces the problem of the lack of a common EU Patent, despite some agreement on its principal attributes.[44] In 2006, the President of the EPO admitted at a meeting of the EPO's Administrative Council that sovereignty issues would continue to be a problem for harmonisation,[45] although there have been some steps towards closer coordination with the US.[3] Reform is also under way there (for example, the Patent Reform Act of 2005),[46-47] and internationally. For instance, the USPTO set up the 'Alexandria Group' to discuss patent law harmonisation[48-49] and WIPO is working on the Substantive Patent Law Treaty (SPLT),[50-51] with the aim of finding commonalities between national and regional substantive patent law.

Whether all the groupings and nations can agree on a global regime – as business interests might like – is another question. Fundamental differences such as first-to-invent (US) versus first-to-file (Europe and others) are sure to result in protracted debate. And differences around issues such as patent quality (usually related to the perceived height of the inventive step or ethical considerations) are also likely to hinder moves to rationalise the system. As Michael Kirk, Executive Director of the American Intellectual Property Law Association says, "The World Patent is something my grandchildren will not see, but it is the ultimate patent system: search once, examine once, and grant a patent that is recognised around the world."[52]

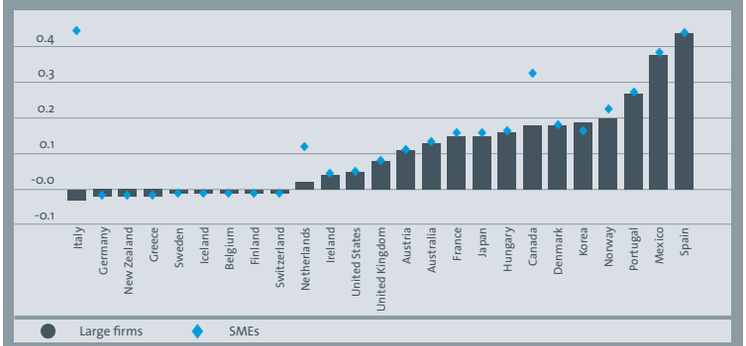
Accounting for IP

Internal and international rationalisation of the IPR system is only half the story, at least as far as business is concerned. International agreements such as Basel II (on capital adequacy requirements for lenders) and IFRS have started to require organisations to identify the true value of their IP rights as part of their assets, along with the recognition of the risks these present. This in turn requires confidence in the validity of granted rights from all users of IPR. Although the US does not use IFRS, its own Financial Accounting Standards Board (FASB) has rules covering intangible asset valuation and 'impairment' (revaluation for each new financial report) and the Sarbanes-Oxley Act requires management to sign off on regular audits of their intangible assets. Consequently, the CEOs and CFOs of major companies may be held responsible for incorrect evaluation and reporting of IP rights. Already, in the US, some class action law-suits have been filed on this basis.[54] This ratchets up the stakes for business: if the protections around IPR



Above: How a single patent regime might look "As the JPO, the USPTO and the EPO account for 80% of patent applications, it would be logical for them to start a process of unification. I envisage three interim steps, first unifying the format, then undertaking a single search, then unifying the examination procedure, by which time the ideal system of one single patent will be achievable."
Hisamitsu Arai, Secretary-General of Intellectual Property Strategy for the Cabinet Secretariat of Japan.[4]

Rates of tax reduction for 1 unit of R&D spending, 2004



Source: OECD Science, Technology and Industry Outlook 2004

Above: Tax breaks for innovation There are large global discrepancies in the tax breaks awarded to companies for investing in R&D. But while this may affect overall research spending and possibly the location of R&D efforts by multinationals, it's a less subtle instrument in terms of understanding how the resulting IP might be used or exploited by the businesses.

Typical costs of IP litigation

England: (High Court)**: £1m** (Patent County Court)**: £150-£250**

France: €30-50k

Netherlands: €10-40k

Germany: €25-50k depending on scale fees

US: $2-4m and upwards

Source: Intellectual Property Advisory Committee (IPAC)[53]

> **Firms are purchasing the patent portfolios of companies that have gone into bankruptcy, not to market products, but to determine where the rights can be asserted. Also, some law firms are seeking out patents on which to base lawsuits on a contingency fee basis. This seems to be a growth industry, and the cumulative impact is really beginning to be felt.**
>
> **Mike Kirk**, Executive Director of the American Intellectual Property Law Association (EPO Interview)[65]

are called into question, or the system for granting rights is unwieldy, executives have to handle uncertainties that, if managed incorrectly, may land them in prison.

More positively, some countries[28] (and even some states within the US)[55-57] offer tax breaks around the monetisation of IPR based on local R&D efforts. But R&D, which generates these rights, is also global now and the subject of many competing tax incentive schemes with the intention of attracting foreign investment.[58] For example, in 2003 US companies spent US$140 billion on R&D in the US, but also spent US$22 billion on R&D abroad. This all makes it more challenging to simplify an IPR system that includes the outside influence of variable business rewards for different activities in different jurisdictions.

The cost of uncertain patent systems

Tax issues are relatively minor, however, compared to the costs businesses face for litigation around patent rights – and infringement cases are also part of a wider issue around enforceability of such rights, where uncertainty creates risk and therefore cost for companies. Within Europe, patents can only be enforced at national level. Indeed, an EPO patent may still be declared invalid within these countries by their national courts. That lack of validity may only come to light when a patent holder tries to use his patent against alleged infringers.[59]

Patent insurance

If patents are now a business commodity (with both upside and downside risk), they ought to be the subject of risk management tools. Patent liability or defensive insurance[83] helps an alleged infringer fight off a lawsuit; patent pursuance or offensive insurance (which is more proactive) helps the owner of patent rights file suit.

Only around 750 policies have been written over a period of 25 years in Europe. But a recent EU study[84] into IP insurance concluded that a European Patent Litigation scheme would encourage prospective patentees, particularly smaller companies which would be able to respond more 'intelligently' to allegations of infringement, rather than simply giving in to threats. Such a scheme would need to be low cost, compulsory and use a simplified risk assessment process.[85]

However, the problems of moral hazard, the difficulties in quantifying the risk from a patent portfolio and the law of large numbers required to provide premiums at a reasonable cost are all factors making this difficult to achieve.

Right: IBM is credited as one of the first large companies to see the revenue possibilities in its patent portfolio.

Recent European Court of Justice (ECJ) decisions[60] reiterated the limitation on enforcement: "Patents are strictly national rights, and so diverging decisions in different jurisdictions cannot be seen as contradictory."[61] Infringement of a European Patent, which should be seen as a bundle of patents, may therefore lead to separate litigation in separate states of the EU with possibly different outcomes. "A possible solution for a common judicial structure [is] the European Patent Litigation Agreement (EPLA)," says Örjan Grundén, President, Association Internationale pour la Protection de la Propriété Intellectuelle (AIPPI). "To come to a common system… requires political will – that politicians regard the issue as important enough for the European economy, for its development and prosperity, to make it happen."[62]

In the US, litigation has been seen as patentee favourable since the 1982 formation of the Court of Appeals for the Federal Circuit (CAFC), which has jurisdiction over patents laws. The court's pro-patentee stance is held by some to give too much support to allegations of infringement.[63] A recent decision of the Supreme Court (eBay v Merc-Exchanges LLC) overturned the lower, CAFC court's support for injunctions against alleged infringers which had previously threatened to cause uproar in the BlackBerry case (RIM v NTP). The Supreme Court is now considering the issue of damages resulting from exports sales (Microsoft v AT&T). A CAFC ruling and the February 2007 decision by a Californian jury in Alcatel v Microsoft appear to have extended US patent law to overseas activities.[64]

In fact, the upside for a patent troll usually lies in markets where the cost of litigation is so high that settlement is generally seen to be a preferable option. "RIM didn't settle [the] suit [with NTP] because it thought it would lose the legal arguments; it settled because of the uncertainty of buyers with regard to the possible waste of investment," one expert in IP as assets told this project confidentially. "IP has implications beyond lawyers, engineers and R&D. It's a subject which needs to be on the minds of every chief executive… it isn't something which is quietly negotiated in the backroom."

Some see this as a failure of the legal system, made more acute because the patent system itself tries to secure rewards for innovation. "Those who, mistakenly, uphold a belief that excessive litigation can serve as a good protection of rights and as a useful market enforcer should realise that in product liability, for example, in the US slightly over 50% of the gross revenue from successful cases ends up in the pockets of the law firms," says Professor Jacques Pelkmans, Director of European Economic Studies at the College of Europe in Bruges.

Quantity and complexity may rise again

As long ago as 1999, the authors of *Rembrandts in the Attic: Unlocking the Hidden Value of Patents*[29] had noted that there was a massive potential upside for businesses if they used IP properly. "Patent licensing revenues have shot up 700% in just the past eight years alone, from US$15bn in 1990 to well over US$100bn in 1998," they claimed. "The licensing market is still in its infancy… revenues could top half-a-trillion dollars annually by the middle of the next decade. American businesses are ignoring an astonishing US$1 trillion in intellectual property asset wealth. We believe this represents the single greatest asset utilisation opportunity to be laid in the lap of corporate chief financial officers in a generation."[78]

But management of IP assets still does not appear to be considered a top priority in many corporate boardrooms,[79] although the enhanced legal duty to shareholders in Sarbanes-Oxley in the US and mechanisms for valuing IP in new accounting standards seemed certain to force business to change. The uncertainties of the current valuation methods mean that there is a drive to find a suitable method which will meet the new International Accounting Standards and the requirements of Basel II. IP risk management has, however, gained momentum: IP risk issues can and will arise,[80] and insurers[81] and consultants[82] are now offering services to manage this type of risk.

In a sign that the existing patent system has been incredibly successful for the business community, some more advanced companies are starting to treat patents more coherently as

IBM: Big Blue sets the trends on IP

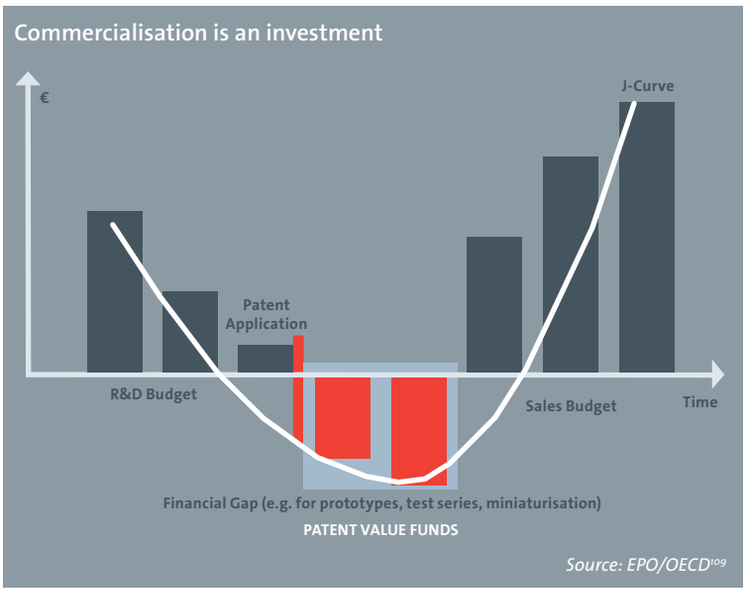
During the 1990s IBM CEO Lou Gerstner needed to reverse heavy losses ($8bn in 1993 alone).[66] Under his leadership, IBM increased revenues from patent royalties from $30m (in 1990) to $1bn (in 2000).[67-68] In January 2007, IBM stated that – for the 14th consecutive year – it had received more US patents than any other company: 3,651, almost 50% more than runner-up Samsung.[69]

In 2005 IBM started the limited release of the IPR on over 500 patents for use in 'open source' projects to 'encourage innovation.'[70] For example, on the Open Services Gateway initiative Service Platform, IBM agreed not to assert any of its patents in order "to foster innovation" (in fact, they allowed royalty-free access on those patents to all companies[71]). IBM also reached an agreement to support the Red Hat Enterprise Linux operating system, even though this appeared to compete with its own products, in order to grow its customer base.[72]

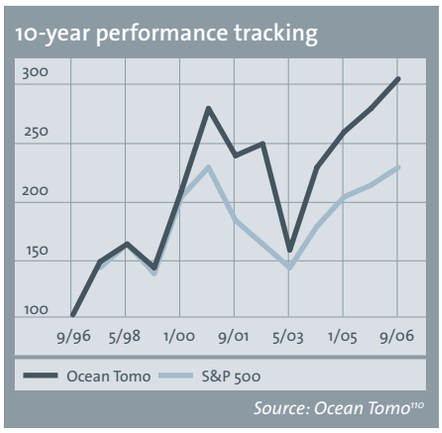
In September 2006 IBM announced a new IP strategy.[73] It committed to helping the USPTO assess patent applications; released half of its own 'business process' patents for other companies to use; and opened its own applications to community review. "IBM is holding itself to a higher standard than any law requires because it's urgent that patent quality is improved, to both stimulate innovation and provide greater clarity for the protection and enforcement of intellectual property rights," said Dr John Kelly III, IBM senior VP for Technology and Intellectual Property.

IBM's view is now that, "Pure business methods without technical merit should not be patentable", which would reduce filing numbers; they should still be published to prevent others from patenting the method. It also announced an initiative to establish open source software as prior art[74] and another to lobby for a Patent Quality Index,[75] designed to be a key element in creating a properly functioning IP market.[76]

Critics of software patents, however, argue that the moves are incompatible with IBM's support for computer implemented invention (CII) patents in Europe and point out that the actions tacitly support their view that software patents are intrinsically bad for innovation.[77]



Above: The 'valley of death' is the development phase that exists between funding R&D to secure a patent and actually realising the monetary benefits of the commercialised product. The gap is particularly dangerous for smaller companies and universities; large companies have enough projects under development at any one time to cross-fund projects and rapidly commercialise innovation.[86]



Above: The patent index According to its creators, the Ocean Tomo 300 "represents a diversified portfolio of 300 companies that own valuable patents. The Index, which would have outperformed the S&P® 500 by 310 basis points annualised for the ten years ended September 2006, is a valuable tool for analysts, financial advisers and investors."[87]

an asset – even a derivative product that leaves the corporation as a trader in IP rather than purely its creator and/or exploiter. (Others, interestingly, are starting to adapt their own strategy to make up for what they perceive as weaknesses in the system.) That opens the door for some interesting new methods of handling IPR.

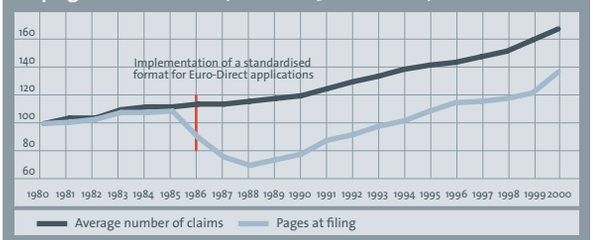
However, the problems of moral hazard, the difficulties in quantifying the risk from a patent portfolio and the law of large numbers required to provide premiums at a reasonable cost are all factors making this difficult to achieve, although a market at Lloyds is emerging.

Patents as tradable commodities

One of the reasons this is attractive is that the move from a raw patent to commercialisation requires investment – the 'Valley of Death' to some.[86] There are substantial costs involved in the stages between the financing of R&D and realisation of the value of the ideas covered by the patents – which in the meantime can be licensed, sold or bartered. These costs include legal and consulting fees for the identification of suitable buyers or licensors, checking title and open source contamination issues, valuation and compliance costs.[88]

As a result, many varieties of patent exchanges have emerged. The European Commission established a network of 70 Innovation Relay Centres (IRCs) in 1995, for example, that have facilitated about 1,000 technology transfer deals – including agreements for the sale, licensing, distribution or joint development of new technologies.[28] The EPO provides links to available online patent licensing exchanges[89] (even eBay can be a source of patents) and a

Increasing size of applications in terms of number of pages and claims (as % of 1980 values)



Source: EPO[111]

Above: The tyranny of workload Recent figures[100-101] have shown that in all three trilateral offices, not only has the workload increased in terms of number of applications but also the average number of claims per application. At the EPO, average claims per application rose 50% between 1995 and 2004, despite any claim filed above ten incurring additional fees. This increase has resulted in a corresponding increase in procedural complexity which has been worsened by a sharp rise in the sheer number of pages in applications, (see chart) which, at the EPO, has led to more official actions before grant and hence a delay in the process.[102]

Cost of a sample European Patent[1]

EPO Fees:	EUR	4,600
• procedural fees before the EPO		
• renewal fees for 3rd and 4th year		
Percentage of total		*14%*

Validation in the contracting states		
4 transactions:	EUR ca	7,000
• attorney	EUR	3,000
• translation cost	EUR	3,600
• publication fees	EUR	400
Percentage of total		*22%*

Total cost: EUR ca. 32,000

Professional representation before the EPO:	EUR ca	10,000
• pre-filing	EUR	4,000
• processing	EUR	5,400
• translation of claims	EUR	600
Percentage of total		*31%*

National renewal fees and related cost:	EUR ca	10,000
• renewal fees (years 5-10)	EUR	4,700
• attorney payment of renewal fees	EUR	5,300
Percentage of total		*32%*

18 pages, 6 states, 10-year term, excl. in-house preparation costs for the patentee, all values rounded

Source: EPO[112]

Right: Upping the ante Patent application costs are the ante to get into the corporate game now. But businesses love to rationalise cost – if a company's net margin is 10%, each $1 saved is the equivalent of $10 of additional revenue. So costs in the now heavily used patent system are a major factor, quite apart from the timeliness, efficiency, effects and enforcement of IPR. At an approximate cost per EPO filing of €32,000,[103] both large companies and particularly SMEs are feeling the pinch.

Patent Exchange Centre was opened in April 2005 in Shanghai.[90]

"Companies such as ThinkFire and General Patent Corporation International provide IP licensing and enforcement services to inventors and IP owners, often on a contingency fee basis," said Kroll's Kimberley Cauthorn. "Some firms, such as ThinkFire, may also represent clients in IP buy/sell transactions. Capital Value Partners is another firm that provides arm's-length buy-side and sell-side transaction services to buyers and sellers of IP assets."[88]

A number of companies are providing online IP trading platforms.[91-94] Chicago-based Ocean Tomo runs an online marketplace for buying and selling patents,[95] in some cases combined with offers to license and, since 2006, has organised physical IP auctions which include the sale of patent rights from large corporations. In October 2006, it also announced the introduction on the American Stock Exchange (AMEX) of a patent index, "the first equity index based on the value of corporate intellectual property… designed to represent a group of companies that own high-quality patent portfolios."[96] In Europe, meanwhile, May 2007 will see the expansion of the IP auction idea when IP Auctions GmbH holds the first European patent auction in Munich, IPA being the sister company of IP Bewertungs AG which introduced the first Patent Value Fund in Europe in 2004. The fund "invests only in patent realisation and commercialisation."

Faith in the system?

This is all giving companies greater incentives to use the patent system – which is a sign that the patent offices and their staff have done a great job up to now. Even though there are backlogs and concerns about quality, costs and litigation, the system still garners support. As long ago as 1958, Fritz Machlup admitted to the US Congress that, "It would be irresponsible on the basis of our present knowledge of its economic consequences, to recommend instituting [IPR controls]. But since we have had a patent system for a long time, it would be irresponsible… to recommend abolishing it."[97] That view has prevailed: in 2006, IBM's Roger Burt insisted that "the patent system as it currently stands is capable of working perfectly well [although] that is not to say that improvements are impossible."[98]

US Senate Hearings have heard testimony from the high-tech industries that the US patent litigation system – not the patent system itself – is broken.[99] They say it encourages the purchase of old patents rather than innovation, tempting companies to rely on plaintiff-favouring litigation to earn profits. Those companies want procedures to challenge a patent to be held at an early stage of the patent's life and to repair the balance in the system back from a relatively new trend of issuing permanent injunctions against patent infringement. The number of claims per patent application has been rising all over the world – another sign that that strength of the system is, in many ways, its downfall.

Add a global dimension, and the complexity, lack of harmonisation, cost (which is higher in Europe thanks to the potential requirement to translate granted European Patents patents into more than 20 languages), timeliness, litigation and enforcement all look like problems that demand reform. "[While] it is no easy task to reform patent law in Europe, we have common goals: to remedy as far as possible and as soon as possible the shortcomings of our worthy old European patent, to prepare the way for the future Community patent system," said EPO President Alain Pompidou in 2006.[104]

Reform of some kind is surely inevitable if the patent system's key customers are to be kept happy. Business has not, and will not, stand still when it comes to exploiting all the assets at its disposal. And IPR is most definitely a key asset now. "Twenty-five years ago, only a handful of active venture capitalists existed," says Ocean Tomo's Justin Basara. "In much the same way, patent trolls that may have been absent from the corporate radar ten years ago will likely give momentum to the birth of new entities as yet unimagined [so that] additional and other models for IP transactions will develop in the future" ■

MARKET RULES SCENARIO: THE JOURNEY TO 2025

In parallel with the continuing growth in patent filings and the ability of the patent system to support this being doubted, business interest in IP heightened the pressures on the system. The demands for action intensified as the outlook was only a worsening of the system and business needs dictated that all the elements of the global patent system had to be put under the microscope.

It would be easy to blame the liberal humanities for the fall in the number of science and technology graduates in Europe and the US. Where once schools turned out students qualified to study the sciences and engineering at university, by 2007 they had been overtaken by media studies and management, far more attractive options for what some called the slacker generations. But in reality, the business community in the West had already started to look for its R&D capacity elsewhere – the jobs for science graduates just weren't as prevalent as they had been. Companies needed intellectual property and the manpower to create it was more abundant in other countries, the emerging economies of south and east Asia. The economic slowdown in the West after 2008, when budget deficits caught up with the US and EU governments, didn't help.

The competitive pressures on business had been getting more intense, in any case, thanks to globalisation and fleet-footed new rivals, empowered by the internet, challenging established corporates. They had put up a good fight – as the scope of patentability kept growing, their sheer scale helped them file more and more patents and they got much smarter about controlling and exploiting their patent portfolios, too.

All this activity meant that, in 2008, all three Trilateral patent offices had introduced new charges, but the workload still outpaced even these swollen budgets. Staffing was a nightmare – even if the business world had offshored its R&D, smart graduates were still required to man the patent offices in Europe, the US and Japan. But the scarcity of science experts meant wages had begun to spiral.

Worse, the size, complexity and volume of patent applications was still increasing – steps to reduce application page numbers had dented the average size of submissions in 2009, but, for complex legal reasons, the volumes shot up again within the year.

The USPTO followed the lead of its main customers, outsourcing workload to other patent offices in Asia, Canada and Australia. But that just made the corporations increase the pressure on the USPTO to harmonise its practices with those of other patent offices all over the world to meet growing workload and criticism about patent quality, which had started to create a growing backlog of litigation in the US courts.

Attempts at wide-scale patent reform in 2010 were blocked by disagreement among the lobby groups – some of which supported the changes (particularly the creation of a new class of patent which would include a compulsory licence of rights), and others which protested that the system as it stood was working just fine. Piecemeal reforms did go through, although many argued that they simply made the system more unwieldy.

But 2010 did see two major steps to harmonisation. The Asian patent offices (which had been remarkably successful at coordinating their activities between themselves) adopted English for filings – which pleased both Asian and Anglophone corporations immensely. Japan rolled out an extended automatic translation system to simplify application processing and reduce costs. And, in Europe, the prospective new EU Patent was scheduled to be ready before the turn of the decade. (It wasn't.)

In fact, the corporations hadn't been standing still themselves while all this was happening. The patent exchanges and horse-trading of IP that had started in the early years of the century had become more refined. In 2011, CNN started to quote the IP300 Index as a key market index, replacing the NASDAQ which had become increasingly unreliable as a bellwether of corporate health in the knowledge economy.

After the four-year economic contraction had ended in 2012, businesses in the West had regained confidence. But the more vicious elements of competition remained. Corporate jockeying was nothing new, of course, but stung by the hard years either side of 2012, the US government had made maintaining its economic and business competitive advantage an over-riding priority. And, given that corporate trading in IP had become so much more sophisticated as IPR had developed into, effectively, a new asset class, it was happy to encourage US businesses to use patents as competitive weapons. Hey – the system worked, the value of IP traded worldwide proved that. So applications for patents continued to grow.

As a result of this continual rise in patent activity (bear in mind, the Chinese had got the patent bug in a big way back in 2009, since when their application numbers outside China, especially in the US, had increased rapidly), the USPTO was struggling to stay ahead of the game. In an attempt to simplify matters, and to make it easier for corporations to patent globally, it did adopt a first-to-file policy late in 2013.

But the workload at the patent offices wasn't the only driver for change. Increased litigation, which was costing businesses billions of dollars in legal fees and ever-more extravagant 'greenmail' episodes committed by patent trolls, convinced both the financial regulators and the corporate lobbyists that something had to give.

What many of the biggest companies wanted (and plenty of small ones, come to that, especially in the high-tech fields) was wholesale reform – and preferably a Global Patent that would simplify filings, reduce ambiguity around enforcement and protect global exploitation of expensively researched patents. These calls were global – Japanese, Chinese and European companies were just as keen, although, in 2014, another EU patent initiative failed to make it through the minefield of the enlarged Union (now up to 29 states).

But in 2015 harmonisation had taken a step forward. The USPTO and its partner offices agreed to share all search and examination data; they standardised the format and procedures around application processing; established quality audit mechanisms; and shared a transparent database of prior art, based on the phenomenal success of the Google Patent system.

The hiccup came in 2016. The success of the IPR-based financial instruments and the large-scale IP trading floors (used by most of the blue-chip corporates) had created something of a bubble. One of the larger PLECs, Tessier-Ashpool Inc, created a huge scandal when rogue elements on its IP trading floor perpetrated a massive 'pump and dump' operation that left thousands of companies with worthless IPR and billions of dollars siphoned off to shell companies. CEO Henry Case was indicted and a Congressional investigation into the IP asset class was launched in 2018.

After the Tessier-Ashpool scandal, the pressure grew for a more harmonised global patent regime. With the Asian bloc already operating as a de facto single patent office after the Chinese and Japanese systems merged in 2019, the US took the lead in what became, in effect, a Pacific Rim group that shared information and methodology – and language – in issuing patents. The 2020 Accord wasn't exactly a single system – but de facto mutual recognition between all concerned parties meant that (what turned out to be) a US-centric model dominated a significant part of the global patent system.

Back in Europe, economic growth had been slower to recover and the governments were pre-occupied with a crisis in the public sector. Low birth rates, an aging (but radical) population expecting their state pension commitments to be honoured and the collapse of several private pension funds during the economic slowdown were worries enough. But the smarter EU politicians had growing concerns about EU business competitiveness. Get that solved, they figured, and the pension problem might solve itself.

Along with the Pacific Rim link-up, it was just the spur that was needed to get the EU to agree to a common European patent in 2021 – and by carefully selecting compatible systems and process, to join the global patent family. Corporate leaders hailed the move as a breakthrough for European business – there was now a level playing field in most of the global patent system, and the global market they had been enjoying for nearly three decades now had an appropriate tool for IPR management.

The IP world in 2025

The IP world is dynamic and pro-active, seeking to secure value for innovative businesses. The IPR system no longer sees patent protection as a defensive strategy for a company, to be used as a last resort in the courts, but rather as a commodity to be exploited and developed.

Patents have a well-understood value in their own right as well as combined in portfolios – they're more like the more exotic financial products of the 20th century and the uncertainty of their value over time makes them attractive to speculators.

This interest has fuelled ever-increased numbers of patent applications – a rush to acquire patent rights, particularly in new areas of research. If the price of applying is low enough, figure businesses, it is always worth investing. The more financially astute can support their investment with multiple applications and can apply financial market techniques to spread their risk; others join the game even if they are not technologically innovative. However, improved valuation techniques also eliminate many trivial patent applications at the first hurdle.

Raw technological change has therefore been displaced as the key to IP success by financial and business skills. Patent professionals have been replaced by 'intermediaries' who know how to maximise value, acquire rights and create earnings from retained IPR.

Licensing is a huge business – not only to maximum profits, but also as a strategy to support emerging lines of business and brand new markets. Today's patent professional has to know about the extended range of markets for any product, since an IP right is now more widely recognised as an intrinsically tradable product around the world.

Business no longer accepts any waste within the IP system – in particular, the cost demands of unnecessary translations and litigation under multiple jurisdictions. But although there's a more-or-less united world patent process, a 'single filing, one patent, one litigation' system is still not politically achievable.

Some SMEs, which had long complained about the cost and resource problems of managing IPR in the 20th century, have become more willing and able to engage in the system. The cost of obtaining a patent, and the cost of litigating, is no longer so daunting.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KEY QUESTIONS

- **Could ever-increasing quantity overwhelm the patent system?**
- **Will the desire for patent rights continue to increase or will there be a tipping point?**
- **How might issues of enforcement impact the further development of patent rights as a financial asset?**

Brad had the biggest marble collection in the playground. Marbles were an obsession: a proof of status, a currency, the armoury in the all-important marble games at play time.

Brad made up the rules for the games and he was brilliant. He would lend marbles to less fortunate boys in exchange for sweets, so long as they didn't play against him. It was an extra rule in the game.

Brad only gave marbles to one boy, Hui, even though his own gang didn't know him very well. When he played marbles, he liked to play by his own rules, with another friend Jignesh. If Brad needed someone to do his paper round or other odd jobs, he'd pay Hui (or Jignesh) a few marbles.

Pretty soon Hui had built up an impressive marble collection. He had lots of them to use in the games, so more of the other boys were willing to use his rules if they wanted to play.

Suddenly, Brad found that his marble collection looked puny next to Hui's – even Jignesh's marble-bag was starting to look big. So Brad's gang decided not to play with Hui, Jignesh or their new gangs ever again, even though they'd never win back the marbles.

"Fine," said Hui. He had most of the marbles he wanted from Brad now, in any case.

There were still boys in the playground who weren't part of any gang. Amadi and the other smaller boys hardly had any marbles at all and just got ignored. They were sad they couldn't play, but Amadi got them together and started to make up their own games with their own rules.

The other gangs were too busy to notice what was happening to all those marbles they played with. Amadi thought, what have I got to lose from helping myself when they're not looking?

Moral: You can play a good card once too often.

WHOSE GAME?


POLICIA

WHOSE GAME?

It's the story of conflict in the face of changing geopolitical balances and competing ambitions, where Power and Global Jungle are the major driving forces, but in contrast to the business-led scenario, the states are the key players.

The evidence that points to this scenario is...

> **The major factor on the global scale has to be how developing nations throughout the world view and develop intellectual property.**
>
> **Jon W Dudas**
> Undersecretary for Commerce for Intellectual Property and Director, USPTO (EPO Interview)

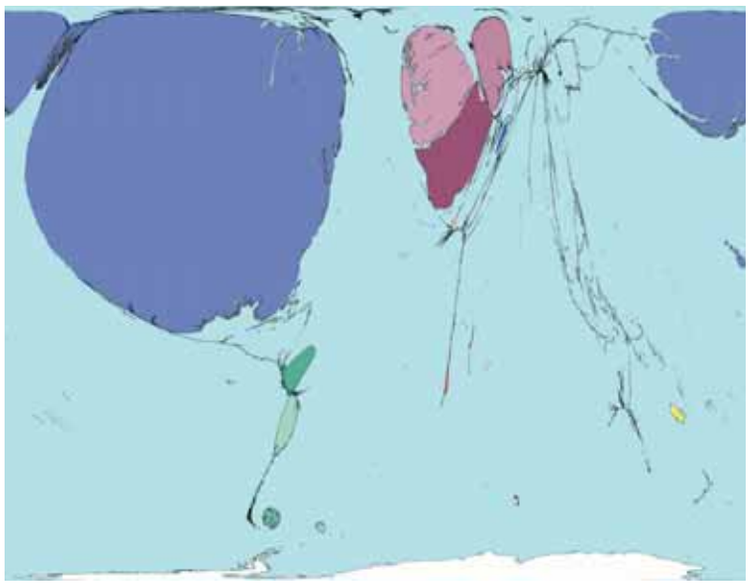
Photo: © Chris Sattlburger/Panos Pictures

Globalisation defines every facet of our age – and the management and regulation of intellectual property rights (IPR) is no exception. Although the mechanics and definitions of globalisation are still poorly understood[1] and the process is far from even, there are important currents and trends that show which new powers and power structures are likely to emerge – and what effect that will have on the existing patent system.

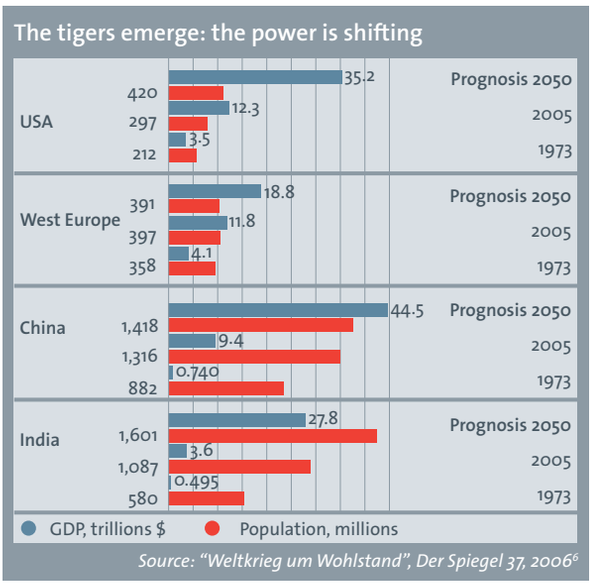
States are still the key actors. But we now have new players on the scene and new layers of complexity to deal with. Non-state actors are increasingly important: global corporations, international political movements and NGOs are creating worldwide alliances capable of influencing events. More specifically, in the field of IPR, the World Intellectual Property Organisation (WIPO), the World Trade Organisation (WTO) and other supra-national bodies define the institutional framework. However, international associations such as International Chamber of Commerce and Association Internationale pour la Protection de la Propriété Intellectuelle have been playing an institutional role since the establishment of the Paris Union in 1873.

Indeed, the management of IPR has had a global component for some time. Patents and respect for other intellectual property rights have been an important aspect of trade agreements and bilateral treaties for years. But in 1995, that link between IP and trade was heavily reinforced. "Internationally, the TRIPS Agreement was a historic defining event, although the final chapter has not yet been written," says Michael Kirk, Executive Director of the American Intellectual Property Law Association.[2]

The Trade Related Intellectual Property System (TRIPS) agreement was negotiated during the General Agreement on Tariffs and Trade's (GATT) last round as a side agreement of the WTO framework. It required countries to adopt adequate intellectual property protection systems to satisfy minimum norms for the protection of IP rights, as well as rules for their enforcement. TRIPS also established a mechanism to impose sanctions on any country that fails to satisfy its obligations to adopt the correct rules. But is it adaptable enough in the face of changing global priorities in areas such as health and development? And how will it cope as the balance of power



Above: The IP money flows. On this map,[4] country size is relative to net royalty inflows. Only 18 (out of 200) territories are net collectors of licence fees and royalties – Asia, Africa and Oceania are virtually invisible. People living in less than a tenth of the territories in the world between them receive the bulk of net export earnings for these services. US IP is now valued at US$5 trillion and makes up 45% of its GDP. Source: BBC News website, WTO/World Bank[5]



Above right: The Tigers emerge. In 1973, the combined GDP of West Europe and US was six times greater than that of India and China. In 2050, the GDP of India and China will be 1.3 times greater than that of Europe and US and the population of the Asian powers will increase faster than that of the Western ones.

> **Any proposal to modify the US patent system usually runs into the sand. But from the trade and diplomatic points of view they are active.**
>
> **Richard Yung**, French Senator (EPO Interview)

Viewpoint

"When India raised the issue in the 1960s it was the Indian government along with some other countries that pushed the issue. They came up against an alliance consisting of the United Kingdom and the United States along with a very powerful publishing cartel. This asymmetric power situation has, to some extent, been equalised by the emergence of civil society that has analytical capabilities. Civil society is not just a political force. It also operates in an evidence-based way and can debate issues at the technical level, something that was perhaps not true a couple of decades ago."

Professor Peter Drahos, Director of the Centre for Governance of Knowledge and Development and Head of Programme of the Regulatory Institutions Network at the Australian National University (EPO Interview)

> Flashes of genius based on individual creativity have been replaced by a collaborative approach. Knowledge is no longer produced in isolation but in many technical areas is produced by way of a highly cumulative innovation process.
> See page 88

shifts between different parts of the world as new players seek to exploit it in the same way as the traditional IP superpowers?

The global trends

Our own period of globalisation differs from previous ones in a number of important areas, and there are also some clearly visible trends that will shape the future.

- The nature and volume of trade have changed. There's more of it and there's been a shift from raw materials to manufactured goods, services, education, telecommunications – and, as a result, royalties, licences and other IP-related items.
- The role and influence of transnational corporations (TNCs) has increased,[3] altering the nature of foreign direct investment.
- Most of the world has embraced some kind of free market system. This has enabled the integration of financial markets but it also creates antagonisms around natural resources and energy as consumption also rockets.
- Hundreds of millions of Asians will become 'global consumers' over the next ten years;[7] tens of millions of educated Asians are already in the global workforce.[8] The activities of Western-controlled TNCs will be increasingly criticised as these new entrants start imposing their rules on the game.
- The perceived difficulties of the WTO to create consensus around the Doha negotiation round and the exploding number of Regional Trade Agreements (RTAs) could be signs that globalisation is losing momentum.[9,10]

Where IP meets globalisation

All of these players have IPR agendas – and their own issues around the implementation and enforcement of the treaties and agreements. But the current IP system is locally and regionally administered within a global context that may not reflect the reality on the ground. "Currently search, examination, patent granting and enforcement are all being undertaken independently by the different patent offices, yet the infringer works internationally," says Hisamitsu Arai, Secretary General at the Intellectual Property Strategy Headquarters of the Cabinet Secretariat in Japan. "All levels of the patent system require harmonisation, and this will take some time, yet experts still use the same arguments against change that they did eight or ten years ago. The patent system is old-fashioned and the current system based on territoriality is doomed to become obsolete – there is a contradiction in terms."[11]

Global IP agreements have usually been managed at the WIPO, part of the UN. But when IP was linked explicitly to trade (in the GATT and then the WTO), its status changed fundamentally. "With TRIPS, intellectual property was included into the framework of multinational trade negotiations and so came to the attention of a broader range of policymakers in government and the public," says Dr Francis Gurry, Deputy Director General of WIPO. "It gained a much higher profile in international relations. Paradoxically, TRIPs also changed the nature of international IP policy. In the one hundred years preceding it, international IP was rather self-contained and was designed to respond to its own incentives. TRIPS takes into account the impact of IP on other areas of public policy, creating a major shift in the international IP framework." [12] In other words, the IPR regime has become something of a political football – and its administration a negotiating chip in a wider geopolitical context.

It's not just the broader objectives of the players that threatens to complicate the landscape for IP. The drivers of globalisation itself may not be all that reliable. It's no coincidence that the long negotiations of the GATT Uruguay round, for example, were concluded in 1994, shortly after the fall of the USSR. So the current phase of globalisation, which started in the mid-1970s,

Is the globalisation already discredited?

Nobel-winning economist and former Clinton White House staff member Joseph Stiglitz thinks so. In particular, the failure of Western modern market economics to deliver balanced benefits is hurting its progress: "Recent advances in economic theory have shown that whenever information is imperfect and markets incomplete, which is to say always, and especially in developing countries, then the invisible hand works most imperfectly."[9]

"The EU is terrified of losing its industries to the US, everyone is frightened of China and Chinese colleagues have told me that they are too busy competing to worry about ethics. This is what, at the moment, we mean by globalisation.[13]

John Sulston, former Director of the Wellcome Trust Sanger Institute, expert on the human genome project and winner of the 2002 Nobel Prize for Physiology.

TRIPS – a basic guide

"It started as a very good idea in the GATT to regulate commercial relationships between countries in order to avoid the kind of protectionism that caused problems earlier, and we feel that the GATT is basically a system that can promote good commercial relationships. However, in the WTO now we have other agreements that are beyond trade, such as intellectual property in particular, and this has led to many controversies and problems... So there is a growing opinion, even among the economists who believe in free trade, that it might not have been a good idea to locate TRIPS inside the WTO. It could have been negotiated in WIPO, where it belongs as an intellectual property issue, and WIPO is the organisation that should deal with intellectual property."

Martin Khor (EPO Interview)

Whereas IP policies have been concentrated in WIPO, political decisions are now increasingly taken also in other multilateral forums, in particular at WTO's Council for Trade Related Aspects of Intellectual Property Rights. TRIPS agreement's main features are:

- Each country must provide for a minimum level of IP protection – for example, copyright should last 50 years.
- Effective enforcement procedures must be available in each state.
- National patent laws must be "without discrimination as to the place of invention." So drugs became patentable all over the world.
- Transitional provisions exist for delaying the introduction of drug patents in developing countries.
- Member states can partly limit the extent of national IP rights by adopting "measures necessary to protect public health and nutrition."
- At the Doha Declaration in 2001, a separate agreement reaffirmed governments' right to use the TRIPS flexibilities and clarified some of their forms, such as compulsory licensing and parallel importing.
- Failure to comply with TRIPS can result in trade sanctions.

is not a natural, unstoppable process, but a geopolitical phenomenon, boosted after the fall of European communism in the 1990s and benefiting from transformations within the technological and socioeconomic systems. Consensus from major emerging countries such as India and China allowed the establishment of the WTO and TRIPS – but those countries have changed markedly in the intervening decade.

If just one of the major parameters mutates or fails (for example, if a bi- or multi-polar world emerges again), then the pace and fate of the globalisation process cannot be taken for granted.[14] Assuming that the current international system for protection of IP, as condensed into the TRIPS agreement, is a child of the globalisation mega-trend, can it remain integral if globalisation stutters or takes a different path? Are there forces already working towards a fragmentation of the almost universal framework of WTO and TRIPS?

The global increase in the number of inventions entering the patenting system and the increased use of patenting around complex innovations means the system is, in some ways, a victim of its own popularity.
See page 36

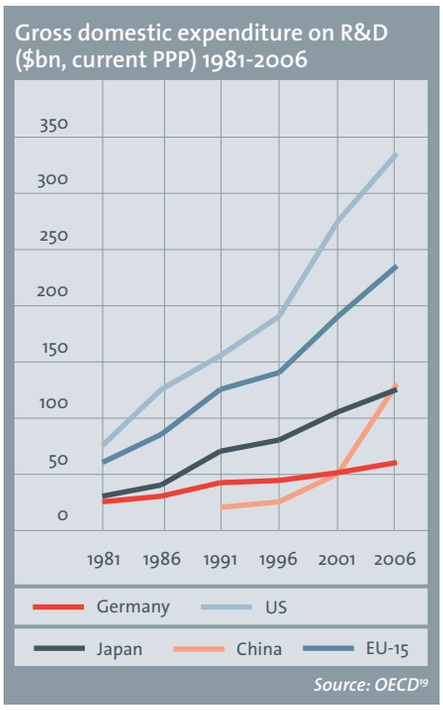
Above: some 600 members of a laughing club laugh under guidance on 11 November, 2006 in Chongqing, Sichuan Province, China. Photo: (CQCB/ChinaFotoPress/Getty Image)

The shift south and east

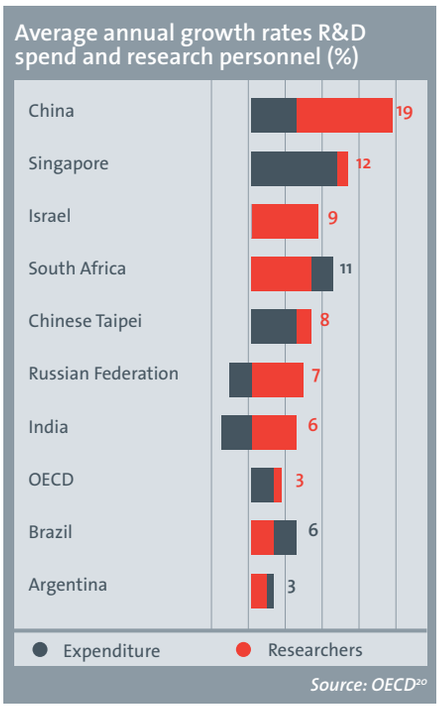
A critical new factor is the internationalisation of science, technology and innovation (STI). A country or region's ability to generate IP, as well as the extent to which it can exploit both domestically-developed and foreign IP, is crucial to understanding how it's likely to behave within a global IPR framework. The trend here is that, following manufacturing, research and development are now moving south and east.

The Rand Corporation report Global Technology Revolution 2020,[15] looking into 16 key technological applications and the capacity of countries to exploit them, recognises the emergence of China and India as rising technological powers – and highlights how the technological revolution is boosting their aspirations to become global players. It also points out that many US multinationals are setting up local R&D operations in those countries – and partnering with 'local' technology firms to license their IP.[16]

Professor Joseph Straus, Director of Max Planck Institute for Intellectual Property, Competition and Tax Law in Munich, argues that TNCs setting up labs for researching integrated circuit rights (ICT) in China is having a profound effect. "This will lead to a clear knowledge transfer to China, irrespective of who the owner of the intellectual property rights is," he says. "As this trend continues, combined with their increasing production skills, more and more skills will be lost in Europe. Over time, this will mean a lack of employment in Europe in these sectors."[17]



Above: A new power in R&D
According to an OECD report[18], China now spends more on R&D as a percentage of GDP than Japan, and is the world's second highest investor after the US. China's spending has more than doubled from 0.6% of GDP in 1995 (US$17bn in current money) to just over 1.2% in 2004 (US$94bn).



Above: According to the OECD report,[18] non-OECD economies are increasing their share in globalised R&D: "In terms of growth in R&D expenditure, most non-OECD economies under review more than doubled their R&D expenditures over the decade between 1995 and 2004, while growth in the OECD area as a whole was 56% over the same period, in other words, about half of the growth rate of non-member economies." The report further states that " In China, the number of researchers increased by 77% between 1995 and 2004. China now ranks second worldwide with 926000 researchers, just behind the US (more than 1.3 million)."

Indigenous knowledge: the IP 'owners' who are losing out

"Genetic resources and Traditional Knowledge must be accounted for to ensure that the benefits of the patent system are shared by all, not reserved to one part of the world. As developing countries, we will keep asking ourselves what we can do when they come and take our richness, our knowledge – while, when there is a case of counterfeit, the whole world attacks us."

Anthioumane N'Diaye, Director General, Organisation Africaine de la Propriété Intellectuelle (OAPI)
(EPO Interview)

"There is a growing awareness in developing countries of the economic value of biodiversity and related biological technical (ethnobotanical) knowledge. To these countries, the debate now revolves around two questions. How can they use the patent system to defend themselves against the (mis)appropriation of their biological resources and technical knowledge? And, how can they use the patent system to exploit for their own gain these resources and such knowledge?"

Professor Coenraad Visser, Head, Department of Mercantile Law, University of South Africa
(EPO Interview)

Many scientists and researchers in the developing world complain that Western researchers draw on their local knowledge, without providing recognition – academic or financial. This means that there is little or no cooperation or interaction between local and Westernised knowledge systems. In addition, while the knowledge is usually owned by the community as a whole, it can be expropriated by a particular individual. Many see this as a commons issue: "We need to preserve the global commons, but patenting goes against this: this is the tragedy of the commons," says Professor Henk ten Have of the Division of Ethics of Science and Technology at UNESCO.[25]

Governments of developing countries are seeking practical ways to share the benefits from using genetic material and knowledge in accordance with the United Nations Convention on Biological Diversity (CBD).[26] This is the background of the ongoing struggle in the international forums about the form and legal reach of declaring in the patent application the source of genetic material and indigenous knowledge used in developing the final product.[27, 28, 29]

Additionally, many countries currently lower down the league table for STI exploitation are using their biggest asset – their people – more creatively now. According to the OECD Science, Technology and Industry Outlook 2006,[18] for example, the number of Chinese students studying overseas trebled between 2000 and 2003 and the government is making a concerted effort to ensure they return home with their newly acquired knowledge.

It's this rapid growth in R&D intensity – engineered, in many cases, by governments conscious that patents are a strategic lever – that's levelling the playing field and actually bringing many high-growth economies into the debate. It's the process Thomas Friedman described in his 2005 book, *The World is Flat*. Now, more than ever, they have a something to fight for. "Fed up with waiting for technology to trickle down from the developed nations, developing countries have begun to realise that they are better off cooperating with each other, and have started to work together to meet their technology needs," says Calestous Juma, Professor of the Practice of International Development and Director of the Science, Technology, and Globalisation Project.[21]

China is certainly trying to improve IPR protection to monetise its innovations. Recent measures in this area include reducing the time required to examine patent applications (while the United States Patent and Trademark Office (USPTO) and the European Patent Office (EPO) in particular are seeing longer pendency times), creating patent information services, and funding enterprises that applied for patents both at home and abroad. South Africa is another example: it has a Draft Bill for the protection of Indigenous Knowledge Systems that recognises the importance of protecting its biological resources and indigenous knowledge which are seen as a comparative advantage.

So if a plant or traditional knowledge outside the US is not documented it may be patentable in the US (such as Mexican Enola beans or Indian basmati rice), causing huge international discontent.
See page 77

Patent rights

These STI developments have already caused a shift in the ownership of IP. India, for example, has seen the proportion of its home-grown inventions that are owned by foreign companies almost halve in a decade – and a significant increase in the number of patents held by domestic companies for inventions created outside India.[22] Companies such as Infor are now taking a lead in IP for their own global niche.

According to the OECD report,[18] US firms are still investing ever more aggressively abroad: 750 foreign R&D centres had been set up in China by the end of 2004 and over 100 multinational firms have established R&D facilities in India.[23] But now Asian states, in particular, appear to be playing a more sophisticated role in these R&D networks, moving from customising US technologies for local markets into more creative research.

The UN Conference on Trade and Development says this shift is partly down to the cost and availability of researchers.[24] But it's not just lower wages: the available pool of skilled scientists and engineers is a major factor, and the presence of an increasingly strong and competitively priced human capital base next to huge markets and new production facilities is the most important reason for locating R&D in China. (It helps that China has as many university students and graduates, in absolute terms, as the US and the EU).[24]

"While policymakers regard S&T [science and technology] as a race between nations in a zero-sum game, businesses see themselves as part of a global information network… Government officials are more concerned about stemming the flow of technologies to competitors and

Billions of Euros are now at stake for companies licensing their patented IP, putting ever greater pressure on the IPR regulators to offer certainty, speed and frameworks for dispute resolution. See page 38

possible rivals who might use it for military objectives… However, firms and businesses prefer a system that leads to the dissemination of knowledge, including to political rivals."[30]

Some multinationals are starting to see the threat from this development and are already changing the way they exploit their patents portfolio in order to head off competition from emerging economies – before the tipping point. The OECD report[18] cites Hitachi, which earned licensing revenues of ¥43bn in 2002, then changed its licensing policy in 2003 from one of openness to a more closed approach "to preserve its competitive advantage through greater control of inventions."[31] Why? The rapid improvement in the technology of Korean and Chinese competitors. The OECD concludes that "holding strong patents seems to be a key success factor," a lesson not lost on South Korea in particular.

Follow the money

Naturally, developing economies need to balance the advantages of foreign direct investment from multinational R&D efforts with the potential loss of IPR on domestic innovation, the increased competition for domestically owned businesses (which, studies have shown, can push lower home-grown companies with lower productivity out of the market)[32] and a possible outflow of technology. Even if many multinational corporations now see the benefits of locating genuinely innovative R&D facilities abroad,[33] it's clear that technology transfer is not a one-way street.

This is a huge challenge for the patent regimes – why, say developing nations, should we do all the work in research and manufacture, protect the IPR of the owner yet see little of the revenues and developmental advantages from the IP? "Originally, society received technical information in return for local protection and in the process was able to generate goods and wealth," says Dr Roberto Jaguaribe, former president of the Brazil National Institute of Intellectual Property. "[But now] there is little local production: technical information is not always made fully available, and some countries do not have the means to benefit from it when it is. This is an area of concern."[34]

It's the developed, OECD states that are seeing significant increases in international licensing revenues – which is consistent, for example, with growth in the number of US patent applications.[35] Global international receipts for IP increased from $10bn in 1985 to around $110bn in 2004, but more than 90% of the money went to the three major OECD regions.

Forces of fragmentation

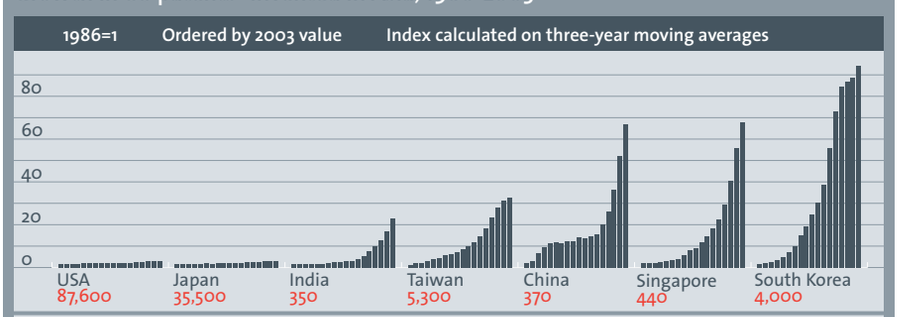
The big conundrum, then, is the fast-growing, well-populated states – commonly known as 'BRICs' (Brazil, Russia, India, China, although some append South Africa to the list). While the level of absolute poverty may be falling in these countries, relative national, regional and international disparities are still growing; more widely, it's clear the UN Millennium Development Goals[41] cannot be achieved for many of the world's inhabitants.

The result is that international organisations linked to the globalisation process, in particular the WTO, are coming in for strong criticism. Even within 'developed' countries, deregulation and an increasingly global integrated workforce can lead to massive job losses.[42] According to a poll in 2006, three-quarters of Americans say they are either worse off or no better off than they were six years ago.[43]

Calls for protectionism or 'managed trade' are getting louder.[14, 44] Discussing the impact of several key factors in medium- and long-term prospects of the world economy, the Report of the World Bank 2005[10] comes also to the conclusion that: "All of these factors heighten the risk of a resurgence in protectionist sentiment, which would thwart the pace at which developing countries are able to achieve their poverty reduction objectives."

There are also major cultural challenges to the development of a global patent framework. In China, for example, the rules are based on respect of tradition and hierarchy; "copying has traditionally been a major part of artistic training, as a sign of reverence rather than lack of originality," says Prof Zheng Chengsi, director of the Intellectual Property Centre in China.[45] And the second 'pillar' of the patent system (public

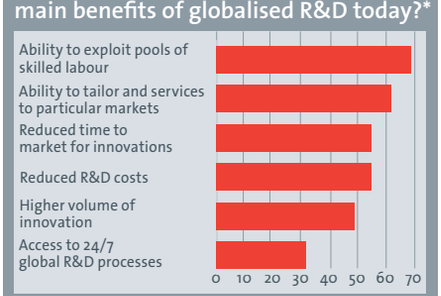
Growth in US patents* invented in Asia, 1986-2003



Source: Dr Hicks, D. "Growth in Asian S&T Capability and R&D Offshoring."[36]

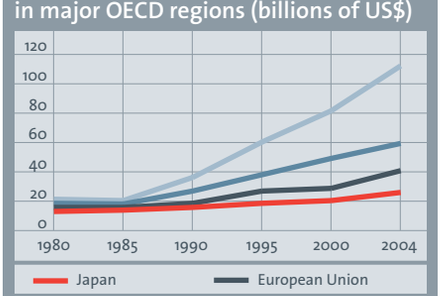
> **If Chinese inventors got the same taste for patents as Taiwanese ones, the effect would be amazing. Taiwan is the fourth country in terms of patent grants in the US, although it has just 20 million inhabitants compared to 1.3 billion in China. Add India, and you get an idea of the numbers of applications patent offices will have to deal with.**
>
> **Dominique Guellec**, Ex-Chief Economist, European Patent Office (EPO Interview)

What do executives believe are the main benefits of globalised R&D today?*



Source: Economist Intelligence Unit[37]

Receipts from international licensing in major OECD regions (billions of US$)



Source: OECD[38]

Top left: Multipolar patenting
Between 1986 and 2003, the number of US patents invented somewhere else grew massively: three-fold for innovations originating in Europe, by a factor of six for Japan and by more than 50 times for Asia. Increasingly those applications are coming from companies domiciled in those regions, not from US firms conducting research there.

Bottom far left: The global search for talent
By 2004, 70% of executives were looking to global markets to provide R&D expertise. But it's not just low wages: a more recent survey[39] on the reasons for locating R&D in emerging countries confirmed the lesser importance of labour costs and a growing need for sheer numbers of IP 'creators.'

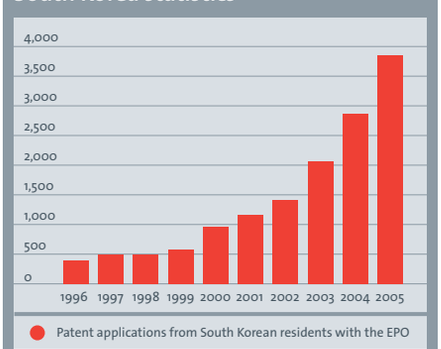
Bottom left: Earning from overseas
Although the figures are startling, the OECD report warns that a sizeable chunk of the increase in revenues paid between countries for IP royalties is down to licences paid between affiliated firms. With those transactions removed, Japan, for example, sees a technology licensing trade surplus of ¥130bn turn into a deficit of ¥45bn.[40]

Right: Demonstrators hold banners reading "The AIDS movement alerts: Patents Are Bad For Health." Health Ministry Officials had said Brazil, internationally recognised for its anti-AIDS programmes, might break the patent on some AIDS drugs held by international drug companies. Photo: Mauricio Lima/ AFP/Getty Images

Right: Korean patent mega-growth
The data on Korean patenting activity is compelling. Trends in patent applications made to the EPO show how its innovators have fundamentally changed its STI profile and ability to profit from IPR. From almost no applications in 1987, by 2003 South Korea was rivalling established IPR players such as Switzerland, Sweden and Italy[46] in the number of applications.

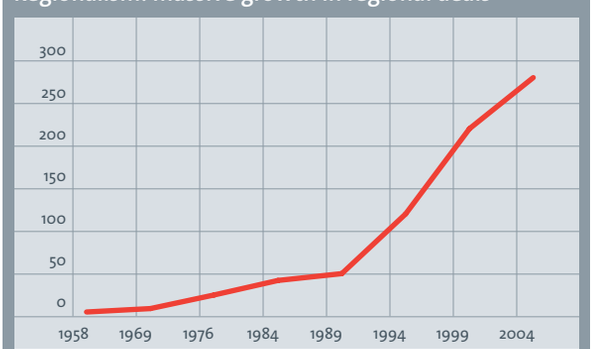
Far right: Massive growth in regional deals
Today, more than one-third of global trade takes place between countries that have some form of reciprocal regional trade agreements. North-South agreements, particularly those with the US, have taken IPR well beyond WTO rules.[47]

South Korea statistics



Source: EPO

Regionalism: massive growth in regional deals



Source: The IBRD/World Bank[10]

disclosure) does not fit very well with the age-old traditions of China's culture, either.[48]

Another big issue is the fight for natural resources in order to satisfy an insatiable thirst for consumption. Reactions from India and China to the UK's *Stern Report* on climate change showed a distinct lack of global unity in this area. "The richer world must make cuts in emissions so that countries like India and China can grow. That is clearly not happening," Sunita Narain, director of the Centre for Science and Environment, a Delhi-based NGO, told *The Financial Times* in 2006. "India and China are making progress within their limited means. But the Western world has created the problem and it is clear that Europe and the richer world must clean up space for us to pollute."[49] Reactions from China were equally muted. Chinese officials insist that "Rich industrialised nations must take the lead in cutting greenhouse gases since they bear the 'unshirkable responsibility' for causing global warming."[50]

Finally, the era of the 'global war on terror' threatens to increase alienation between different cultures and religious groups, reinforcing centrifugal tendencies and regional alliances based on cultural fundamentals rather than shared global outlooks.[51] The impact of these trends, alone or combined, may have unforeseen consequences for the pace of integration in the world economy and for the international institutions that are governing that process. The impact on developing countries of weakening such multilateral, consensus-based forums is potentially very serious.[10]

The rise of the regions

Amid these growing splits between the haves and have-nots – and the fact that some former 'have-nots' are starting to become stronger in areas such as IP creation that were traditionally dominated by the US, Europe and Japan who defined the IPR regimes – there is now an increasingly regional bias to both trading and geopolitical manoeuvring. The complexity and lack of transparency introduced by a new wave of bilateral and regional trade agreements (RTAs) makes it far harder to construct a simple, workable and effective global IPR regime, even if the goals of such a system could be universally agreed.

There are more than 200 of these agreements in force now, a six-fold increase in just two decades, and it's evident that the European Union (EU) and the US are playing a prominent role in this increasingly complex network of alliances. And while there are a handful of beneficial 'open regionalism' agreements – with low external barriers to trade – RTAs with high external border protection are more common.

History shapes these trading patterns, and the formal agreements almost always follow practice on the ground. From the geopolitically (US versus USSR) and economically (US versus Europe) bipolar world of the 1960s, a geopolitically unipolar, but commercially tri-polar, world has now emerged.[52] But already by the 1970s, a realignment had begun as the dominance of the European and the US blocs decreased from 80% of world trade to 65%; the MERCOSUR group – including Argentina, Brazil, Paraguay and Uruguay, then Venezuela and now associate members Bolivia, Chile, Colombia, Ecuador and Peru – emerged in 1991. Another bloc seems to be forming around South Africa, including Southern African Customs Union (SACU, formed in 1969) countries.[53]

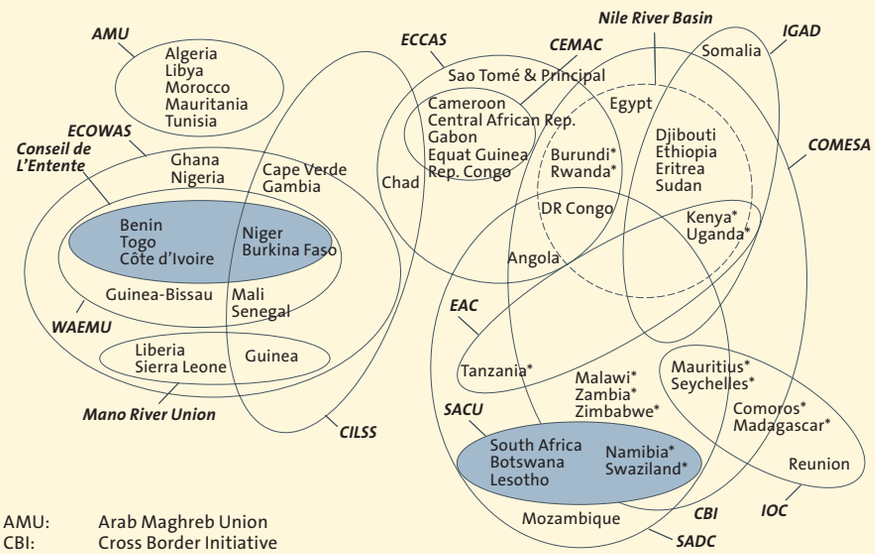
The Asia bloc: a sleeping giant awakes?

The ASEAN Free Trade Area (AFTA), was established in 1992. According to the World Bank, it has "contributed to Southeast Asia's integration. Furthermore, ASEAN leaders accepted in the Bali Declaration the need to pursue deeper integration and to create a single market to enhance the competitiveness of the

Regional trade associations: Complexity squared

Spaghetti and rigatoni: Multiple, overlapping RTAs, 2004[10]

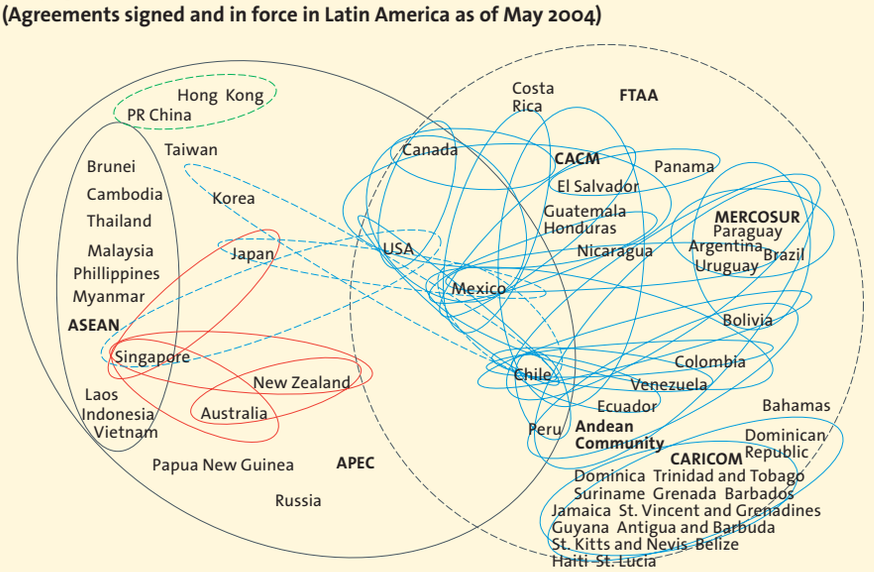
a. African agreements are overlapping



AMU: Arab Maghreb Union
CBI: Cross Border Initiative
CEMAC: Economic and Monetary Community of Central Africa
CILSS: Permanent Interstate Committee on Drought Control in the Sahel
COMESA: Common Market for Eastern and Southern Africa
EAC: East African Cooperation
ECCAS: Economic Community of Central African States
ECOWAS: Economic Community of Western African Studies
IGAD: Inter-Governmental Authority for Government
IOC: Indian Ocean Commission
SACU: Southern African Customs Union
SADC: Southern African Development Community
WAEMU: West African Economic and Monetary Union

* Indicates membership in CBI regional grouping.

b. 'Spaghetti Bowl' of RTAs in the Americas and Asia-Pacific (Agreements signed and in force in Latin America as of May 2004)



— APEC - - FTAA — Intra-Americas in force — Intra-Asia-Pacific in force
- - Intra-Asia-Pacific signed - - Trans-Pacific signed

Source: "Global Economic Prospects: Trade Regionalism and Development", World Bank 2005 (Fig 2.2, p.39)

region. The importance of preferential trade in the region was dramatically increased by the signing of a Free Trade Agreement (FTA) between ASEAN countries and China."[54] China has also spent years working towards the establishment of a free trade zone with India, with which two-way trade has risen to $17.6bn in 2005, from just $260m in 1990.[55] In parallel, it is also reaching out to Latin America and Africa. The 2006 meeting of virtually all African leaders in Beijing clearly marks a remarkable historic and political turn. However, China was repeatedly forced to reassure that it did not come as a colonialist and would never impose "its will or unequal practices" on Africans.[56] And it's even settling its differences with Russia, setting up a regional strategic cooperation framework.[57]

With other countries, including Australia[58] and Japan,[59] looking to plan their long-term development around a resurgent China, it already acts as a gravitational centre. Could it become again the 'Kingdom of the Middle'[60] in the medium term ? What would be the implications for the world trade system and the relative positions of the US and the EU, which have been up to now the champions of the world trade? And how might China leverage its stronger trading and geopolitical position to exploit existing IP norms – or even direct regional and global IPR regimes to its own ends?

A stronger North Atlantic bloc?

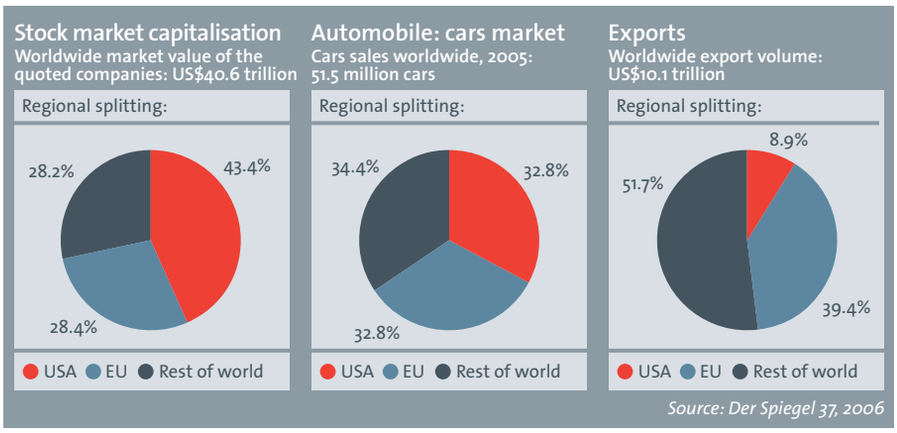
In an interview with *The Financial Times*, Chancellor Angela Merkel insisted that an important plank of Germany's presidency of the EU in 2007 would be strengthening ties with the US. "This partnership is not directed against anyone. Building bulkheads against Asia would be quite senseless, and certainly not in our interest. Of course, if this works, it will make us stronger competitors. But this is certainly not about restricting trade in any way. We want to keep talking in the framework of the Doha round, at the level of the World Trade Organisation."[61] (Interestingly, she mentioned US/EU commonalities on the management of IPR as a key enabler and benefit of closer cooperation across the Atlantic.) In her speeches to the European Parliament and to the 2007 World Economic Forum in Davos, she reiterated this idea, saying that the EU and the US should work to establish "the structures of a single market."

Not everyone is so diplomatic. In recent articles in *Der Spiegel*[62] and *Le Monde*,[63] German politicians and analysts called the current situation an "economic world war" and suggest the creation of a TransAtlantic Free Trade Association (TAFTA), including the US, Canada and the EU.

According to a report of *The Financial Times* "Berlin, Washington and Brussels officials familiar with the plan – part of Germany's agenda as holder of the EU's rotating presidency – said it had received firm backing from President George W Bush and José Manuel Barroso, president of the EU Commission."[64]

Der Spiegel argues that this alliance would include around 13% of world population but 60% of its economic power. Besides increased prosperity for its citizens, it's argued that TAFTA could defend democracy, secure political freedoms and act as a lever for human and labour rights as well as promote higher environmental standards both within the region and with its trading partners[65] (just as membership of the WTO demands certain standards are met). It could also help the West shore up its ability to set technical standards under a common IPR framework.

If these developments lead to a split between Asia and some form of Atlantic bloc, the eventual positioning of Japan, India, Russia and Australia – plus key countries from Latin America, the Middle East and Africa – cannot be easily predicted. And what would be the implications for the multilateral forums such as the WTO, World Bank, IMF – and of course on the international system for protection of IP, TRIPS ?



Above: How the transatlantic bloc stacks up
As the graph shows, any formation of a TAFTA would be a formidable force on the world economic stage, with around 70% of global stock market capitalisation and almost two-thirds of its cars market size. Note, however, that in export terms, the rest of the world already has more than a half share.[62]

TRIPS: what's in it for the LDCs?

But there are already pressures on the existing global IPR system without these blocs coming to loggerheads. While developed countries and their R&D-based industries are satisfied with the greater IP leverage theoretically obtained via TRIPS, developing countries – and particularly the least developed countries (LDCs) that desperately need technological know-how transfer and access to cheap drugs and seeds – are becoming increasingly impatient to see benefits from the agreement.

The full implications of TRIPS have only gradually emerged over the past decade – as Professor Peter Drahos, Director of the Centre for Governance of Knowledge and Development and Head of Programme of the Regulatory Institutions Network at the Australian National University, says, it takes time for the true costs and benefits of a deal that big to work themselves through. "More and more evidence has emerged about who really won and who really lost," he says.[66] In particular, the worldwide publicity on the fight around patents and AIDS drugs in South Africa[67] stoked wider debate about TRIPS and its implications for public health, capital transfers from poor to rich countries and the price to be paid for technology use and transfer. "Until TRIPS, the patent system was perceived as having some inbuilt flexibilities," says Professor Carlos Correa, Director of the Centre for Interdisciplinary Studies on Industrial Property and Economics Law at the University of Buenos Aires. "The Paris Convention had enabled countries to exclude certain areas from patentability, and preserved the countries' ability to determine, inter alia, the duration of patent protection and what exclusive rights were granted. With the TRIPS Agreement these flexibilities were denied to developing countries."[68]

Scientific programmes can improve human capabilities, reducing poverty; technology can boost productivity, increasing economic growth. So technology transfer is a key element of development and is, in fact, one of the 18 targets of the UN's Millennium Development Goals (MDG).[69] But there are serious IP constraints on less developed countries in terms of their ability to innovate and exploit technology.[70, 71] For many of them, it feels like the developed nations set the system up in order to maximise the benefit from their IP ownership – then pulled up the ladder.[72]

Debates in the IP world through the 1960s and 1970s acknowledged this fact,[73] and by 1994 it was formalised in Article 66.2 of TRIPS: "developed country Members shall provide incentives to enterprises and institutions in their territories for the purpose of promoting and encouraging technology transfer to least-developed country Members…" But since then, according to the analysis by the UN Taskforce on STI (part of its Millennium Project 2005),[74] "This provision has received little attention." Therefore the Taskforce put forward a proposal based on a three-tier system of IPR and IPR enforcement to reflect a nation's development level, a similar system to the one proposed by the UK's IPR Commission in 2001.[75]

"The industrialised world made a promise to open up agricultural reforms in return for acknowledgment of IP rights, but this has not happened," says Brad Huther, president and CEO of the International Intellectual Property Institute. "It is time to hold people accountable for what has been negotiated in the past to enable the developing world to improve its lot for the future. If the developing world cannot take advantage of the teaching aspects of the patent system, then the haves and have-nots will perpetually remain in a vicious circle."[76]

The problems with TRIPS

In 2001, the UK government set up the Commission on IPR[77] to "consider whether the rules and institutions of IP protection can contribute to development and the reduction of poverty in developing countries."

The key message of its report was that countries at different levels of development should have different IPR regimes. But the problems with TRIPS have been articulated in many different forums. For least developed countries (LDCs):

'One size fits all' IP doesn't work. LDCs need less strict laws: true innovation can only start after a period of imitation.[78]

TRIPS is costly. The administrative and judicial structures are resource-intensive and the benefits usually flow to holders in developed countries.

TRIPS has failed to stimulate investment in LDCs. For example, the 'working locally' condition is usually fulfilled by importing a product where previously it had to be produced locally.

TRIPS is inflexible. Permitted conditions in the rules did not take into account chronic public health problems (such as AIDS) in many LDCs.[79]

TRIPS prevents development by copying, thanks to the patentability for new subject-matter, such as plant varieties, pharmaceuticals and computer programmes.

Traditional knowledge and biopiracy issues are insufficiently addressed. And there is no link to the Convention on Biological Diversity (CBD, 1992).

> **[TRIPS-plus] agreements are being seen, from an industry standpoint, as addressing the weaknesses of TRIPS. What could not be obtained through TRIPS is being sought here. This is the battleground of the future... One clear thing the post-TRIPS debate has demonstrated is that there are still big differences in perceptions about patents, not just between North and South, but also among stakeholders in Europe and the US.**
>
> **Sisule Musungu**, Programme on Innovation, Access to Knowledge and Intellectual Property, South Centre, Geneva (EPO Interview)

Above: South Africans sing and dance outside the courthouse in Pretoria, where 39 international pharmaceutical companies are challenging a South African law, which would allow the government to override patents and import cheap versions of branded drugs. Photo: Alexander Joe/AFP/Getty Images

The low-income, technologically lagging countries, realising that they are not getting their place in the sun, may react in several ways. They could form south-south alliances, increasingly defying existing rules.[80] Stronger countries could choose to play hard with the rules – for instance, exclusively licensing genetic resources (which could be important for addressing global challenges and threats) to private enterprises.[81]

The Doha round

The concerns of the developing world with TRIPS led to the Doha Declaration on the TRIPS Agreement and Public Health in 2001[82, 83] which stresses that TRIPS should not prevent member states from taking measures to protect public health – for example, during emergencies relating to HIV, tuberculosis and other epidemics. These measures include compulsory licensing or grey imports of patented drugs. The Doha Declaration also extends the final date for LDCs to introduce drug patents to 2016.

In the wake of the Doha declaration the EU has recently adopted a regulation for the compulsory licensing of patents related to the manufacturing of pharmaceuticals for export to developing countries. This regulation is directly applicable to the EU member states. A number of countries headed by the so-called 'friends of development' group have also introduced a proposal at WIPO for a 'Development Agenda,' including issues such as linking the patent system with the CBD and focusing strongly on development aspects of IP, in particular on transfer of technology and delivery of adequate technical assistance to developing countries.[84]

TRIPS-plus: turning the screw

But for many developing countries, the reality now is getting worse. Many of the bilateral trade deals and RTAs include so-called 'TRIPS-plus' clauses.[47, 85, 86, 87] The term refers to the fact that these deals impose higher standards and more limited exceptions for the nations than are provided for under TRIPS itself.

The 2005 World Bank Report[10] states that TRIPS-plus elements in all recent US FTA deals impose extensions on the duration of IPR, both for patents and copyrights. For example, in the US-Cambodia Agreement in 1996, copyright protection was extended to 100 years (compared with the TRIPS mandatory minimum of 50 years). They also require patent protection of plants and animals and limit the use of compulsory licences. The effect of the latter in the sensitive area of pharmaceuticals, together with additionally imposed long periods of marketing exclusivity and restraints on parallel importation, would be to limit the possibilities opened by the Doha Declaration.[47, 67] In the area of digital works, the clauses are often based on standards found in the US Digital Millennium Copyright Act of 1998. "The inclusion of these services, investment, and IPR issues was a contributing factor to the breakdown in negotiations in the Free Trade Area of the Americas," says the report.[10]

The World Bank further states that the stricter TRIPS-plus clauses are not having a positive developmental effect. In fact, some studies show that stronger patent regimes incite multinational companies to stop producing and investing in a country, preferring to use imports to serve those markets.[88] It also estimates that full enforcement of patents could produce additional licence payments of $19bn to the US and $7bn to Germany. It states: "The general conclusion is that countries have to develop an IPR strategy appropriate to their level of development, and then analyse carefully which, if any, IPR provisions ought to be contained in trade treaties or RTAs."[89]

Which is stronger: the need to develop or the need to enforce IPR?

Technology transfer is an important means of accelerating development[90] at a time when developing countries are increasingly eager to exploit the great interconnectedness of today's world. A report by Ginarte and Park[91] presented the relationship between IPR and economic growth for a cross-section of countries for the period 1960 to 1990. This analysis found that IPR and economic growth are interrelated, for example by stimulating the inputs such as R&D and physical capital.

So regimes for capturing and exploiting intellectual assets may not be something that should appear at the final stage of a development trajectory, but at the start. According to Jerome Reichman, Bunyan S Womble Professor of Law at Duke Law School,[92] China, India and Brazil could

Which countries are really advancing?

The Global Competitiveness Index (GCI) is calculated by the World Economic Forum[93] using three 'pillars' for each country – its macroeconomic environment, public institutions and technological readiness. In the latest report, the US slipped out of first place because, says the report, "its overall competitiveness is threatened by large macroeconomic imbalances, particularly rising levels of public indebtedness." Russia's fall, by contrast, is related to lack of trust in its public bodies – a problem that also hampers South Korea despite "world-class levels in certain areas [including] scientific innovation, as captured by data on patent registration."

India's debt levels and weak public bodies balance "excellent scores in capacity for innovation and sophistication of firm operations." China presents the biggest conundrum. "Buoyant growth rates coupled with low inflation, one of the highest savings rates in the world and manageable levels of public debt have boosted China's ranking on the macroeconomy pillar of the GCI to sixth place," says the report. But a largely state-controlled banking sector; low penetration for the latest technologies; and low school enrolment rates are all problematic. And it's fallen from 60th to 80th place in terms of institutional quality.

Left: With an Information Technology boom in full swing in Hyderabad, India, those of the youngest generation exploiting the high wages and better lifestyle let loose on saturday nights. Photo: Robert Nickelsberg/Getty Images.

Right: The Global Competitiveness Index (GCI) is calculated by the World Economic Forum.

Global Competitiveness Index 2006 and 2005 comparisons

Country/Economy	GCI 2006 Rank	GCI 2006 Score	GCI 2005 Rank	Changes 2005-2006
Switzerland	1	5.81	4	↗
Finland	2	5.76	2	→
Sweden	3	5.74	7	↗
Denmark	4	5.70	3	↘
Singapore	5	5.63	5	→
USA	6	5.61	1	↘
Japan	7	5.60	10	↗
Germany	8	5.58	6	↘
Netherlands	9	5.56	11	↗
UK	10	5.54	9	↘
Hong Kong SAR	11	5.46	14	↗
Norway	12	5.42	17	↗
Taiwan, China	13	5.41	8	↘
Korea, Rep.	24	5.13	19	↘
India	43	4.44	45	↗
South Africa	45	4.36	40	↘
China	54	4.24	48	↘
Russian Federation	62	4.08	53	↘
Brazil	66	4.03	57	↘
Angola	125	2.50	–	n/a

– following in the footsteps of the Korean success – climb up the innovation and IP ladder but it would be difficult for other countries to catch up. If they can't, at some point they might lose interest in enforcing the IPR regime as it stands.

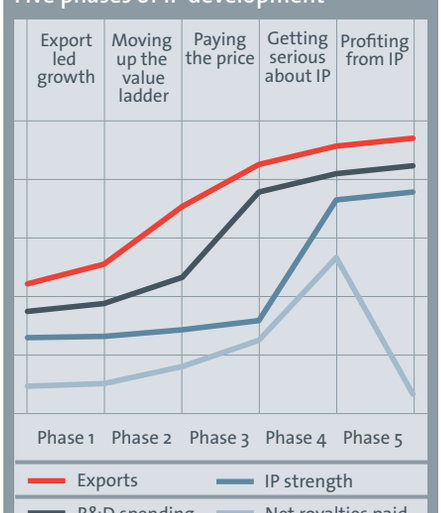
Change is inevitable

IP is perceived as a central piece of the global legal architecture; any major structural changes and shifts in the global geopolitical and technological landscape will cause it to reverberate. That means new trading blocs, a potential decline in US influence, developmental imperatives and, crucially, newly emerging IP power-players will shake the system. As *The Economist's* technology correspondent Ken Cukier says in his interview with the EPO:

"Within the next 40 years, some of the most major innovations in the world will come from elsewhere – outside of the West. For the moment the West is lucky that they don't have IP protection, they don't have a culture of innovation. But within 40 years, you can imagine that the great scientific cures and the great IT innovations are going to come from other regions…

Now, if America and Europe and the West have incredibly strong IP rules, we are going to be binding our hands and feet because we are going to suffer under the same regimes that we are being accused of using to inflict suffering on others. That's why balance is important: it's in our own self-interest. We're moving from a uni-polar to a multi-polar world" ■

Five phases of IP development



Source: The Boston Consulting Group

Above: The Boston Consulting Group has identified the five phases of IP development within nations as shown on the chart. According to Kevin Rivette, vice president of IP strategy at IBM, the paths of economic development, technological progress and IPR strength are not always synchronised – there are often lagging effects. China is a good example: at the moment, it's on a similar path as Japan and Korea in terms of IP development, but it is progressing more speedily than either of them. By the early years of this century, China had just entered Phase 3, as shown above.

Reactions to globalisation

"The past few months have seen a dramatic increase in America's judicial trade surplus: Sarbanes-Oxley regulators raiding UK accounting firms, US competition cops getting heavy with foreign cartels, the feds arresting Scots who run internet gambling businesses from Costa Rica... America is increasingly flexing its judicial muscles abroad. We are watching the rise of a legal superpower, in a world where justice has no borders."

Patti Waldmeir, Columnist at *The Financial Times*[111]

"The adaptation of the essentially territorial IP system to a global economic system will be a challenge that will meet with resistance coming from a whole range of vested interests, amongst them anti-globalists, national legal and patent professionals anxious about the effects of any such adaptation, national patent offices and distribution networks that rely on territorial titles."

Dr Francis Gurry, Deputy Director General of WIPO (EPO Interview)

WHOSE GAME? SCENARIO: THE JOURNEY TO 2025

On the eve of the 21st century, the West had every reason to be confident. The great socialist nations had either crumbled or liberalised their economies and the digital economy was roaring ahead. Capitalist rules had clearly succeeded and now dominated the world.

Global trade, backed by the rules of the WTO, had boomed as smaller countries industrialised, especially in Asia. When India and China joined the WTO, trade doubled. As the new millennium began, low-cost Asian labour provided the world's goods; knowledge workers in Europe, North America and Asia designed critical new technologies; and the rest of the world supplied the necessary energy and raw materials. In this world, there was room for all.

For business leaders within the 'knowledge economies,' the management of IP was critical to their success. Licence fees and royalties were pouring into Japan, Western Europe and especially North America. Competition was inevitable, they told themselves, but sound protection of IP was helping to maintain their lead.

By 2006, however, things were looking less rosy. Terrorist attacks, rising oil prices linked to fears of Middle East instability and declining reserves and higher prices for other commodities had unsettled many in the West. Financial scandals had also dented confidence in corporate governance, while Hurricane Katrina in 2005 brought home to the US the risks of climate change. The world was no longer so stable or predictable.

As fears of insecurity grew, many people sought comfort in closer relationships with their geographical and cultural neighbours. German Chancellor Angela Merkel revived the proposals for a Trans-Atlantic Free Trade Area (TAFTA), for example. Its strength would lie in cultural similarities as much as economic logic. Several in the US welcomed her proposal, but it fizzled out in August 2008 when the oil markets reacted sharply to new military escalation in the Middle East, driving prices up just at the start of a surprisingly hard winter.

The American economy also slowed down suddenly at the start of 2009. Economic analysts initially shrugged off the recession as a temporary blip. But the worsening of the economy exaggerated the protectionist mood as people complained that too many jobs had moved overseas. Globally, insecurity increased with the continued destabilisation thanks to worsening local and regional conflicts. If these worries were not enough, the big new entrants – particularly China and India – intensified the fierce competition for oil and other raw materials, openly exerting their growing power within international institutions such as the WTO.

Economic competition became nastier, and the significance of IP as part of business strategy meant IPRs had become a trade weapon. This only worsened conditions in patent offices around the world, which were increasingly congested by vexatious applications. TRIPS, still governing IP in less-industrialised countries, was a running sore in the WTO. To make matters worse, in 2010 the EU and the US agreed to disagree on a suitable strategy to promote global security and trans-Atlantic relations suffered just at a time where there was real need for concerted action.

But even after the political climate got better, the Western knowledge economies did not improve. In fact (though few said so at the time), their intellectual edge had dulled. As the recession continued into 2012, jobs for skilled people remained hard to find in North America and Europe. New graduates often spent a year searching for work. Many gave up their studies in science or engineering – the courses were expensive, and there were few jobs to pay back student loans. Government spending on basic research was repeatedly cut, forcing many good scientists to emigrate.

Not only was work harder to find in these economies, but it had also got even harder to protect IP. Continued growth in China and India – on the back of lively regional trade – had prompted business in both emerging and developed economies to take a cavalier attitude to intellectual property. Copyrights, trademarks – even whole technological innovations – were freely copied in a rush to get to market at the lowest possible cost. Many of the treaties covering IP were poorly enforced in the gold rush atmosphere prevalent in the newer economies. For every successful suit, there were at least a dozen examples of flagrant IP piracy.

Citing social necessity, drug patents were particularly hard to protect outside the Western world, especially those relating to TB, HIV and malaria. Poorer countries saw 'catching up' and protecting their own people as more important than IP rules.

As Asia grew and the West floundered, many Western-trained Asians returned home. Western multinationals with operations in Asia had been shifting their R&D labs to China and India since the late 1990s, but this trend accelerated throughout the long recession. Not only were Asian inventors cheaper to hire, Asian markets were demanding Asian responses to Asian needs. Already strongly intertwined, the Asian economies grew ever closer as the first decade of the millennium ended. China, South Korea, Taiwan, Singapore and Malaysia were increasingly integrated. Numerous bilateral trade agreements in the region drew Asian economies even closer to China.

Worried about their dependence on Western markets, these nations diversified their knowledge management and production capabilities. Their innovative capacity grew as they explored new businesses backed by Asian, rather than Western, financiers. As a result, by 2013 the proposals for a TAFTA were revived.

Meanwhile, international rows over climate policy intensified as the Kyoto Protocol ended, but the climate continued to change. As they became less able to compete internationally, many Western businesses refused to accept emissions controls without some compensating protection from Asian rivals. Caught between the need for increased environmental protection and the pressures of low-cost Asian competition, Western governments responded creatively. In 2014, the TAFTA negotiations were accelerated. Unlike other trade areas, its barriers were defined by social and environmental protocols.

Only products meeting the highest standards of environmental care and good working practice would be admitted to the US and the EU.

This TAFTA treaty was signed in 2018, creating the largest free trade area in the world. In a mixture of high-mindedness and self-interest, TAFTA argued its case over the new protection barriers at the World Trade Organisation – and won. The emerging powers reacted in 2020 with the creation of the Asian-South American Free Trade Area. The end of the age of multilateral trade agreements, including TRIPS, was nearing. Regionalism, even in the management of IP, was the new game.

But even by 2025, TAFTA has done little to strengthen either the European or American economies. After 50 years of global integration, economies have become too interlocked to be completely protected. Asian investment is still needed by the US government which remains burdened with a mammoth trade deficit. Asian electronics are still sold throughout the world. Asian research and development is now offering serious competition on the cutting edge of many technologies.

The chickens of globalisation have come home to roost and the former knowledge economies have lost control of new knowledge. As Asian innovation took off, the balance of licence fees and royalties moved East. Even the technology for meeting TAFTA's new environmental standards had been developed, not on the shores of the Atlantic, but along the boundaries of the Pacific Ocean. At the beginning of the millennium, many had imagined a single global IP regime. Instead, by 2025, the world had divided. Regional geographies, shared histories and interests, cultural habits and beliefs were pooled in new combinations. Intellectual property was still a strong competitive tool – but it was a tool used differently in different regions.

The IP world in 2025

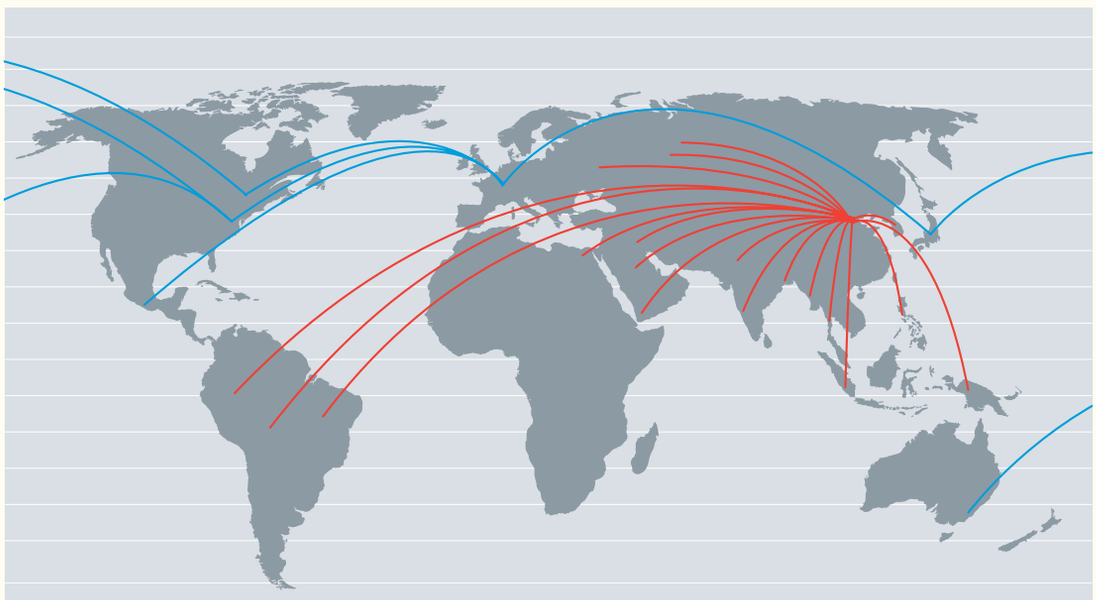
In the TAFTA region, patent protection unravels on several fronts, mainly due to the economic downturn, tightening healthcare budgets and the blocking effect of patents coming from outside TAFTA. Generally, since the traditional patent model does not offer the same competitive advantages anymore, the West is devising alternative protection mechanisms, adapted to different innovation fields. As there is still a strong demand for Western-styled luxury consumption goods, music, movies and design, the West tries to maintain a global protection system with strong enforcement at least in these fields.

However, the governments in the Asia-South America bloc, now with their large research base and innovative industries, pull in the opposite direction. Although they still choose open source models to develop infrastructure, increasingly they use patents to obtain royalties and impose their standards elsewhere. So while in the region they are trying to maintain a largely state-controlled system, at the same time they defend a strong global patent system, including an effective 'national treatment' (with no discrimination).

However, as national treatment is eventually abandoned by TAFTA for residents outside the block, TRIPS is effectively marginalised. As pandemics have politicised health, and while other global institutions are weakened, the WHO took for a while control of public health-related patent rules, in particular regulating patent examination. Hurdles of patentability in the pharma field had been raised and data protection had been restricted. However, eventually different health-related IP regimes have been established in different regions to cover their particular needs in pharmaceuticals.

In south-south alliances, countries experiment with treaties focusing on collective intellectual rights and open source to try to manage their biodiversity heritage (using, for example, state-owned 'res communis'). But the pandemics have also focused them on basic healthcare needs and poverty reduction; they employ mainly publicly financed R&D (creating state-owned IP) for new pharmaceuticals. Most of the least developed countries (LDCs) ignore IP, although some of them coalesce around countries with rich biodiversity to strengthen protection of traditional knowledge and collective intellectual rights. In LDCs, open source (and outright piracy, of course) offers the only route past the digital divide.

How the trade and IP systems could fragment into two blocks



Global trade routes become split into North and South fractions with high barriers between them

'The Club'
Southern Alliance

KEY QUESTIONS

- **What are the main drivers for geopolitical change in the years to come? How might they alter the dynamics of globalisation?**
- **What impact might this have on existing structures and institutions?**
- **How might this impact the IP system globally and regionally?**

The Orchard was huge, stretching around the world and back. It grew lots of different fruits: some were restorative to health. Some gave a sense of euphoria or bestowed new abilities. Others gave long life.

For many years they were tended by a steward who lived in a gatehouse by the orchard. He watered the trees, trimmed them when necessary and occasionally obtained new varieties by crossing. When people wanted to eat the fruits, he would show them to the right tree and accept their offerings, which he partially saved for his master and partially spend on new seedlings, tools and fertiliser. With the remnants he could make a decent living.

The steward grew old. He found it more and more difficult to tend the trees and many bore fewer fruit. Some even became ill and died. There was still a steady stream of visitors to the orchard and he continued to expect payment. But fewer people came so he asked for bigger donations.

One day, he discovered a hole in the wall – right by the peach trees. He waited that night and watched as young people sneaked through and helped themselves to the fruit. So this was why fewer people were coming through the gates! He could never stop up the holes as fast as they appeared. He went to the town council and complained, but they were not sympathetic. "The people are hungry and know your fruit can help them," they said. "But you still expect them to make large donations."

He went back to the gatehouse in a huff. More people came into the orchard, but as well as gathering peaches they also helped themselves to apples and pears. They even started to save the seeds of the fruits to plant them outside the orchard around the village. The master received fewer and fewer payments via the steward, so he asked him what was happening. "Well," started the steward, "you left me in charge, and I was just doing your bidding." "But I put you in charge because you are a local," replied his master. "I expected you to use the fruit to meet the needs of your fellow locals, not live alone in the gatehouse enforcing rules with no thought to your fellows."

The people rejoiced, and the master became even more popular. But the poor steward was left guarding an orchard that was empty.

Moral: Do not attempt to hide things which cannot be hidden.

TREES OF KNOWLEDGE

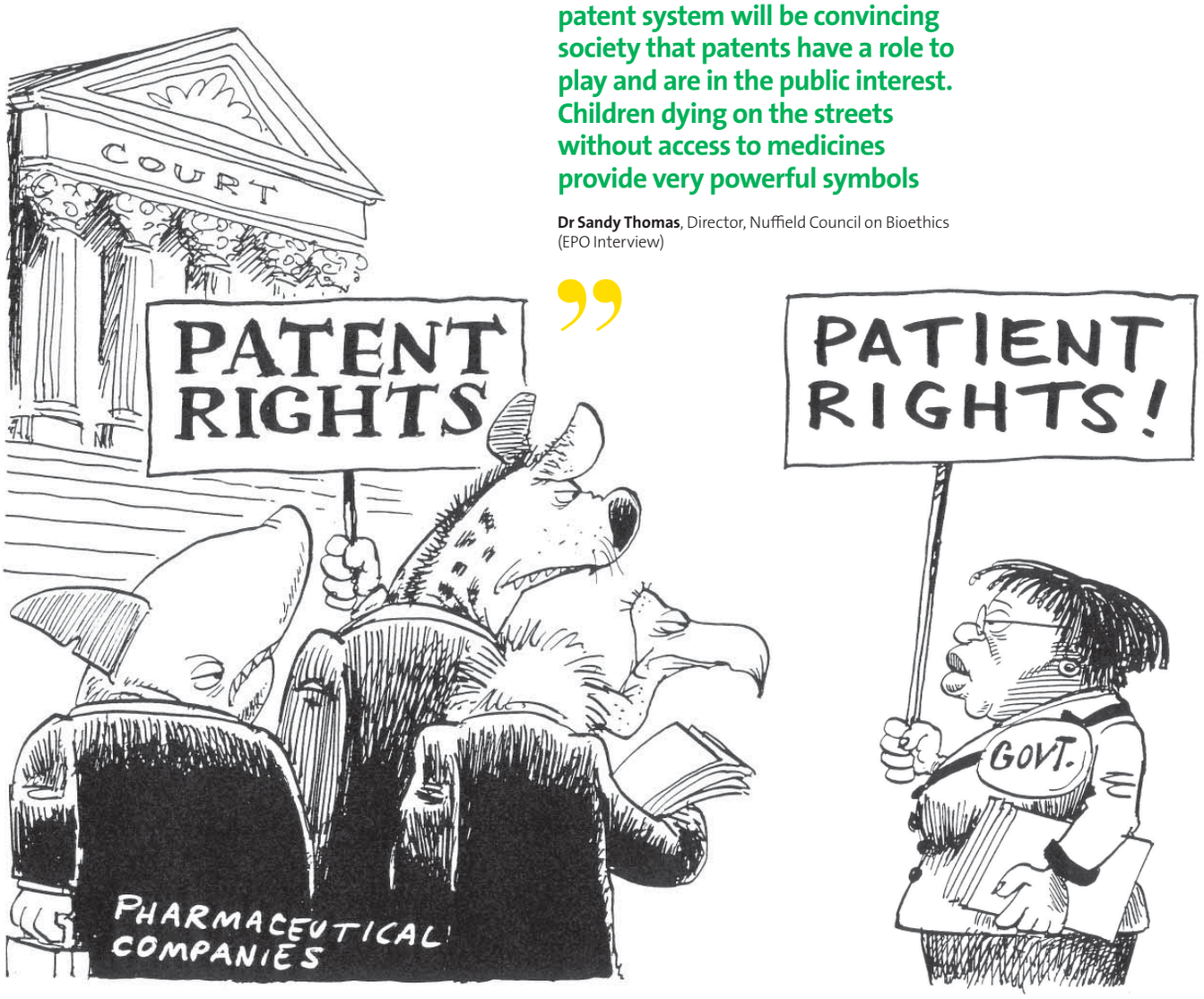
TREES OF KNOWLEDGE

The story of erosion in the face of diminishing societal trust, where Power (from the bottom up) and societal fear of Pace of Change and Systemic Risks – and Knowledge Paradox (in terms of access and control) – are the major driving forces.

The evidence that points to this scenario is...

The greatest challenge for the patent system will be convincing society that patents have a role to play and are in the public interest. Children dying on the streets without access to medicines provide very powerful symbols

Dr Sandy Thomas, Director, Nuffield Council on Bioethics (EPO Interview)



There are already huge strains on the world's systems for managing intellectual property rights (IPR). Consumers are demanding cheap or even free access to patented or copyright protected goods. Patient groups have been pressuring governments over the use of costly patented medicines. Scientists are fighting patents that they feel are blocking research. Programmers are pushing open source projects as an alternative to the established models of IP ownership in the software industry.

Expressions of discontent with IPR systems that have evolved over hundreds of years are part of a wider trend. Trust in governments and political bodies – in established institutions generally – is falling. 'Society' is questioning whether the balance of benefits in the patent system has tilted too far in favour of big corporations. "There is a growing sense that IP is becoming more about private enrichment at the expense of the public good," says Kenneth Cukier, Technology Correspondent at *The Economist*. "The public is now at the IP table. The IP system and IP institutions have not responded well to that – but they need to get better at it."[1]

That's a big challenge. 'Society' today is not a homogenous entity. Globalisation means that we are all part of a worldwide society, with different religions, cultures and nations – and where decisions on technology, knowledge and know-how in one part of the globe affect people everywhere else. More locally, societies have splintered creating a kaleidoscope of interest groups, communities and newly empowered individuals who want their own interests served – even when they might be contradictory to those of their neighbours. Catering for these many world views and value systems is extremely difficult – and will only get harder.

Quality in the balance

There is little doubt that the existing patent system has promoted innovation to the overall benefit of society. In principle, when properly searched and examined, a granted patent offers a useful degree of protection to the inventor and clarity to the wider world about its scope. The limited monopoly provided by the patent gives the inventor a chance to recoup his investment, in return for the availability of the know-how to all. The patent claims also delineate where infringement starts. This idea of balance is often cited as being at the heart of the patent granting process.

Source: *Sowetan*, 6 March 2001, Zapiro©

> **Patents should be a reward for something new, an invention that is a qualitative step change and provides progress for humankind – not simply a return on financial investment.**
>
> **Jorge Alberto Costa e Silva**, Director of the International Center for Mental Health Policy and Research, New York University. (EPO Interview)

Viewpoint

"What is important is to rethink the whole philosophical basis on which intellectual property rests. IP is not a fact of nature; it is to be argued for... IP rights are privileges rather than rights."

Professor Ruth Chadwick, Professor of Bioethics, Director of ESRC Centre for Economic and Social Aspects of Genomics (CESAGen) (EPO Interview)

Source: Reprinted by permission of GlobeScan® Inc.[11]

Above: Who trusts the government – or its agencies – any more? Trust in large organisations – governments, big business, the mainstream media – has been falling for years. In 1997, Joseph Nye and his team at Harvard in their book, *Why people don't trust government*, stated: "The top reasons given are that it is inefficient, wastes money, and spends on the wrong things. Government is not alone."[12] Public confidence in major companies has also fallen from 55% to 21% in 30 years. According to a Zogby poll in 2006, only 3% of Americans fully trust their Congress and just 7% their corporate leaders. Trust in their friends and family remains high at 75%.[13]

But at the beginning of the 21st century patenting activity has moved from industrial knowledge closer to basic knowledge, and many new fields have become patentable. This has led to expressions of public concern that things are now being patented that should be excluded. There are also some widely expressed concerns about quality in the patent system.[2-6] Low quality of granted patents causes higher costs in litigation and increases the price of goods without an accompanying positive effect for society. If trivial or obvious subject matter is patented, monopolies are created for inventions which would have been made without patent protection (indeed lots of inventions are in fact made without patents). Patents that are too broad have a potential to impede innovation.[7, 8]

There are operational and systemic issues related to patent quality:

The operational challenges are the high volume of applications, many of which may not proceed to grant but meanwhile sit as potential threats to others' inventions; the length of time it takes an office to determine the fate of an application; the rigour of examination – a question of whether patent offices are becoming less critical in assessing novelty, non-obviousness, usefulness and sufficient disclosure of an application, while maintaining enough authority for a 'high presumption of validity' to attach to their decisions; and the patentability in certain new fields, notably software, business methods and biotechnology. Difficulties in finding prior art in some technical fields and in languages other than English can result in broad patents that might be seen as blocking innovation.[9, 10]

The systemic challenges centre on whether the system still delivers the benefits to innovation posited in the traditional justification for the grant of patents. Is there a problem of 'capture' – the status quo being lucrative for many players, but lacking effective or consistent policy oversight and being hard for outsiders to engage with? In these circumstances does the system develop a momentum of its own, which is evolving away from the balanced model originally envisaged?

There are also concerns that a 'one size fits all' model cannot justifiably be applied to all societies and all economies regardless of stage of development. An IPR system which differentiates between technologies de facto already exists for some areas, and perhaps represents a better vehicle for promoting innovation.

Defining and measuring 'quality' is fairly straightforward for the business community. Thierry Sueur, vice-Chairman of the Patent Working Group of Business Europe (The Confederation of European Business) says, "We believe quality can be defined as granting patents for deserving inventions, in a reasonable time and at a reasonable cost." And for patent professionals and industry groups 'quality' means 'legal certainty.'[14]

Society's IP contract

But the definition of quality is less clear for wider society, which judges the appropriateness of the IP regime on a combination of hard (cost of living, competitive markets, access to drugs) and soft measures (openness, freedom of information, access to knowledge, privacy, and ethical criteria).[15, 16]

Society's broad contract with the regulators of IPR is based on commonly accepted values that hard work, genuine innovation or a 'flash of genius' – all of which ought to be plusses for society – should be rewarded. The public at large may be less happy with the idea that incremental change, strategic patents or rights over common knowledge should be profitable for the few.

Society also adds an ethical dimension to IP ownership. "Although Americans do care about companies making profits, there's something more important and that's our own safety, security and plain reasonableness,"

So is a (largely) 'one-size-fits-all' patent system that applies broadly the same approach for all technologies workable given this new speed, multidisciplinarity and complexity of technology?
See page 94

says Dan Ravicher, President of the Public Patent Foundation. "So when people see that some people are getting sick and dying because the government gave another company the exclusive right to make a drug, that convinces people quite quickly that something is wrong."[17]

The reform movement

For the critics of extended IP monopolies, this is a fundamental question. As Professor Eben Moglen of the Software Freedom Law Center says: "The greatest challenge will be to create a 21st century world that brings technological freedom: the freedom to understand, study, tinker with, improve, modify, share, keep and teach others what we know. Having grown up with technology, we know that… it enables society to share knowledge, to share liberty… Information is the root and infrastructure of freedom in the 21st century."[18]

He's not alone. "There is now structural distrust in society regarding the way companies are organising themselves," says Dr Jan Staman, Director of the Rathenau Institute in the Netherlands. "The problem is not patenting, but the relationship between national civil society and the global marketplace." And at the heart of this problem is that issue of balance. "The root causes of societal concerns hinge on new technologies and the ethical dilemmas they raise. However, these cannot be dealt with when there is no link between consumer concerns and the marketplace. This has resulted in distrust and unease, in turn leading to attacks on the patent system that serves new technology."[20] Ecologists now team up with farmers to fight patents on plants and animals. Developing country governments are supported by rich countries' civil society groups in their battle for access to medicines. Patient groups join researchers to oppose biotechnology patents.[21] Economists and small- and medium-sized enterprises (SMEs) find common cause with hackers to challenge software patents.[22] Librarians, together with young file-sharers, push for more liberal copyright.[23]

These movements have become possible partly thanks to the internet – which is, appropriately enough, a system built on open standards and shared IP. Blogs, chat rooms, websites and RSS feeds enable immediate exchange of information and co-ordinated action by like-minded groups or individuals. Alliances can be formed and reformed in a fluid, pragmatic way. But a common theme for all these movements is the idea of public access to knowledge, or 'A2K.'[24] The guiding principles for the A2K movement are a balanced IP regime and competitive markets for knowledge goods, open access, open sources and creative commons – movements that have already found powerful ways around the system for regulating IP in their own niches.

The A2K movement started in 2004 around two key events: a proposal from the Brazilian and Argentinean governments for a development agenda at the World Intellectual Property Organisation (WIPO)[25] and the Geneva Declaration on the future of WIPO.[26] Civil society groups then sought to draft an Access to Knowledge treaty that would meet its concerns.

Yale University hosted an A2K Conference in April 2006: "[Our] first goal is to come up with a new analytic framework for the possibly distortive effects of public policies relying exclusively on intellectual property rights," said the organisers. "The A2K initiative seeks to support the adoption and development of alternative ways to foster greater access to knowledge in the digitally connected environment."[27]

Information technology: a test case for IPR

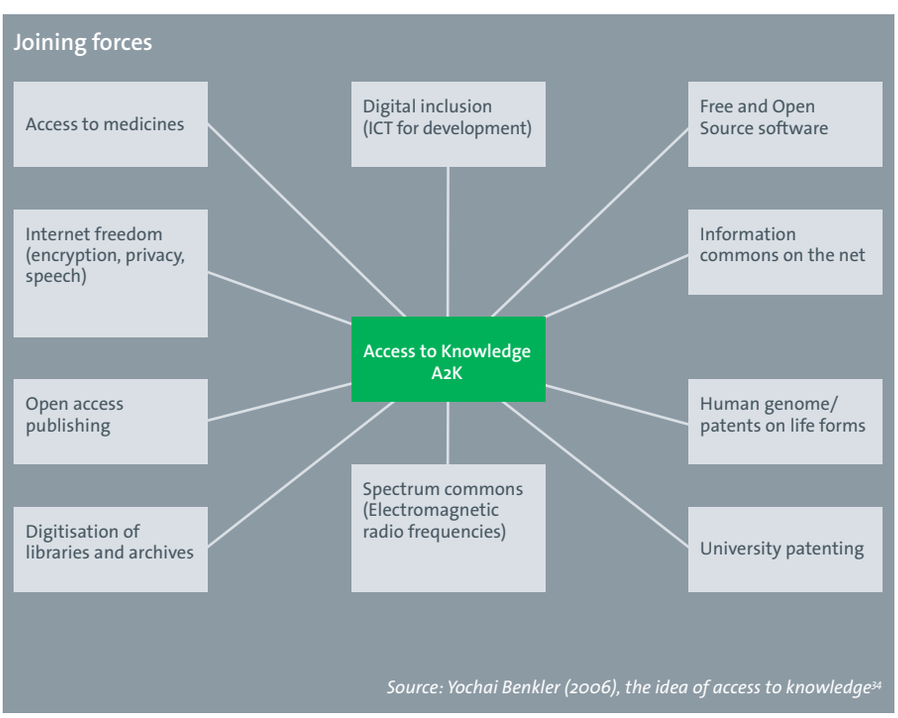
The extension of patentable subject matter over a period of 30 years to include computer implemented inventions (CII)[28, 29] has led to bitter debates, especially in Europe, as SMEs and individuals, sometimes working together, were pitted against the might of large corporate interests.[30-32] Despite the fact that some studies in the semiconductor industry have shown that patents are only a minor factor of success in fast-moving technology fields, there has been an increase in filings in these areas. Other factors – such as secrecy, brand, consumer-orientation and speed-to-market – appear to be at least equally important.[33]

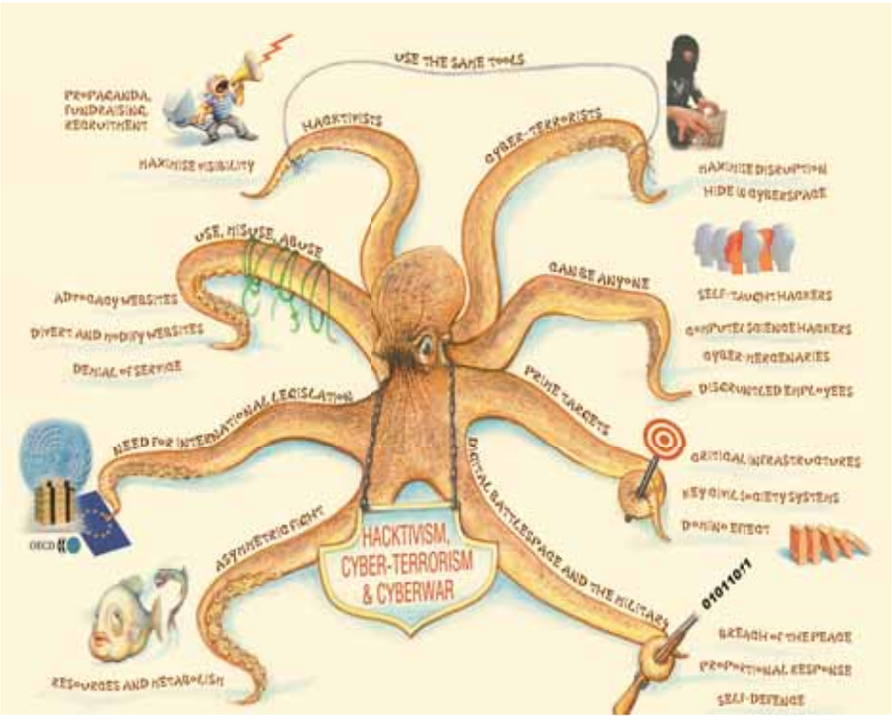
The fact that patents issued on CII don't require the publication of source code led to the criticism that one of the presumed societal benefits of patents is absent in this area. The same holds true for copyright which equally can and often is combined with secrecy of the source code.

Below: Most often, innovation comes from the core community of users. "Our ongoing commitment to enabling our fan base to personalise and enhance their MINDSTORMS experience has reached a new level with our decision to release the firmware for the NXT brick as open source," said Søren Lund, director of LEGO MINDSTORMS. "When we launched the legacy MINDSTORMS platform in 1998, the community found ways to do these things on their own, and we were faced with the question of whether to allow it, which we decided to embrace and encourage. Now, given the strong user base and versatility and power of the NXT platform, the right to hack is a 'no brainer.' We're excited to see how our open approach will push new boundaries of robotic development and are eager for all enthusiasts to share their creations with the community."[19]

Source:
LEGO MINDSTORMS
NXT 8527 by the
The LEGO Group ©2006

Below: 'Access to knowledge' (A2K) is an umbrella movement capturing the many disparate fractions aiming to change the commonly held assumptions about intellectual property and its associated rights. It recognises three basic problems: (a) The enforcement of an over-restrictive IP regime is harming technological innovation, in particular in the information and communications technology sector. (b) Essential knowledge goods based on proprietary ownership of IP (such as, for example, research journals or software) are very costly, in particular for poorer countries. (c) A one-size-fits-all over-restrictive IP regime is not doing justice to the needs of developing countries.





Source: Courtesy of DiploFoundation

> **The younger generation... sees everything that is on the net as floating property. [They] have a perception that such things are common knowledge accessible to all, where it's OK to help yourself, even if it is legally not quite permissible.**
>
> **Ortwin Renn**, Professor at Stuttgart University's Institute of Social Sciences (EPO Interview)

> **The speed of knowledge is moving faster and faster... If there is something juicy with a limited lifetime, it makes more commercial sense to exploit it as much as possible, catching the top of the market, and becoming a winner through not patenting.**
>
> **Professor Jean-Pierre Contzen**, Chairman, Institute of Advanced Studies of the United Nations University (EPO Interview)

The examination of high-tech patent applications for CII, in addition, is sometimes aggravated by the scarcity of patent prior art, raising the quality question again.[9]

In any case, the debate has now moved on – and seemingly in a way that side-steps some of the older IPR arguments. The open source software (OSS) movement does use some protections and controls based on copyright and even patents (to ensure that open source licence conditions can be enforced and as a defence in case of alleged infringement).[35] IBM, the biggest patent holder in the world, currently already generates more revenues from its activities related to Free and Open Source Software (FOSS) than from their patent portfolio.[36]

OSS developments include provisions in their licensing agreements that allow free or low-cost distribution, successive innovation and collaborative development. There's still a debate in the movement about just how free these rights should be, ranging from 'copyleft' advocates like Richard Stallman on the one side to companies selling proprietary versions of 'open' software and providing services or proprietary add-on products on the other.[37] Many agree that the traditional patent system is too slow to cater for these activities and that it tends to capture competitors in a 'prisoner's dilemma'.

This view has also expressed itself in an active anti-software patenting campaign[38] and the emergence of groups fighting further unification of the patent system in Europe (for example, through the introduction of a common litigation system, EPLA); the massive growth in the Free Software Foundation and other open source movements; and the appearance of 'hacktivism' as a political protest form.

> If the IPR holder chooses, they can simply deny any other party the right to use their idea. That simple fact is what creates problems with thickets, gives trolls their leverage and encourages blockage of technical standards.
> See page 95

The problem is that these grass-roots campaigns may come into direct conflict with the institutional notions of IP.

"Today we have the possibility of creating new things by recombining existing goods and services for the use of customers who can take an active role as creative agents as well as consumers of the final commodity," says Professor Paul A David of the University of Oxford & Stanford University. "Yet the recent thrust of the intellectual property regime has been to stop this."[39]

A mass movement against restrictive copyright

Far more widespread 'civil disobedience' against the notion of IPR can be found in the area of entertainment. The 2000 Pew Internet Project report claimed that 78% of US internet users who download music don't think it's stealing; 61% said they don't care if the music they are capturing is copyright protected.[40] Governments are slowly realising that this widespread 'law breaking' is undermining their own legitimacy – copyright and patent systems no longer have the implicit support of the voters. So the increasingly draconian enforcement measures by governments and businesses could create an enormous backlash.

New models might be required to solve these conflicts. "I heard a representative from Universal Studios ask how his company should recoup the US$200 million invested in *King Kong*, if not through a strong IP regime," says Vera Franz of the Open Society Institute. "We should not aim to protect potentially outdated business models that criminalise social practice and hamper technological innovation. Instead, we should advance a balanced IP regime and with it the new models that – thanks to the internet – allow us to combine reward for creators with openness."[41]

Some artists and entertainment businesses are using a two-tiered approach. At one level, they are happy to promote artists through open channels such as blogs, providing free images, music and videos (examples include the Arctic Monkeys or Lily Allen); then they sell more traditional 'products' once they've created their audience. They also want to promote 'experiences' (cinema, live concerts, theatre) which are unique and, unlike digital media, cannot be copied.

Like the software industry, the entertainment sector is looking for new business models by providing add-on services (such as access to well-sorted and classified music libraries) or financing free content by advertising. When YouTube was bought by Google, for example, all of the complete episodes of Comedy Central's TV show *The Colbert Report* that users had uploaded were removed from the site – a classic enforcement of IP rights (using the Digital Millennium Copyright Act).[42] But clips are now freely available online at Comedy Central's own web site, where it can extract advertising revenues from the same viewers.

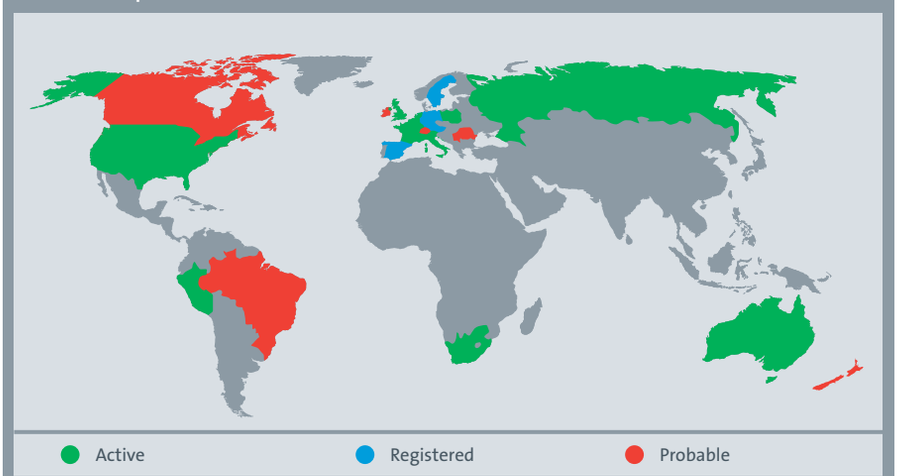
The scientific response

This growing sense that knowledge and information ought to be free – for the public good, and not appropriated and exploited by the few – is not limited to programmers, small businesses and young people sharing music files. It's also prevalent among those who create much of the genuinely new knowledge in the first place.

The Bayh-Dole Act was passed in 1980 in the US to encourage federally funded bodies and universities to patent their research. Similar programmes have been put in place in other industrialised countries. Critics claim that this patenting activity runs contrary to the shared pursuit of academic research, influences priority setting in research, potentially delays publication of results and might block the free dissemination of knowledge generated by public funding – the debate continues amongst economic and legal scholars.[43-46]

Many academic scientists favour a grace period (currently existing only in the US and Japan but not in Europe) to allow the publication of results before filing a patent. But also licensing disputes between academic institutions and private patent holders have caused considerable unease in academia. For example, in the case Madey v Duke University, the courts upheld former Duke professor Madey's claim for patent infringement on a device invented by him at the university – and against Duke's claim for 'experimental use' exception.[47]

IP becomes political



Source: 'Lord Metroid', Wikipedia contributor[52]

Above: The Pirate Party is going global. It aims to abolish patents, restrict copyright and ensure privacy. Photo: John Bäckstrand

Politics and IP

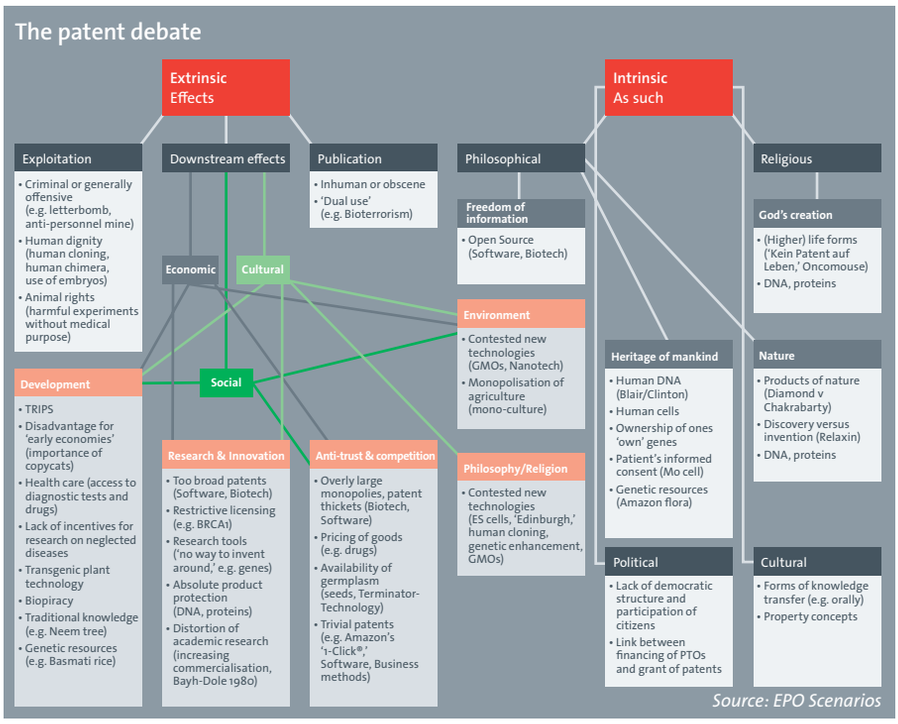
Besides the popular, issues-based movements, a direct political attack on IP is also emerging. The first 'Pirate Party' was founded in Sweden in 2006 and won 34,918 votes (0.63% of the total cast) in the national elections that year;[48] related parties have emerged all over the world. They share three goals: abolish patents, restrict copyright and ensure privacy. Although it seems unlikely that a Pirate Party will ever get elected into a national parliament, it has put the issue of IP on the table for more mainstream parties.[49]

More broadly, many observers see similarities between the evolution of the environmental movement and the IP reform one.[50] Both have active networks of single-issue groups that are clustered as coalitions with similar overall objectives. But while the environmental movement was given momentum by 'the tragedy of the commons' – the overuse of our shared natural resources such as water and fossil energy – the IP reform movement is driven by the tragedy of the anti-commons: the under-exploitation of knowledge held captive by IP owners.[51]

Sharing knowledge, like minimising CO_2 emissions, is considered by many to be essential to achieving a fair balance between rich and poor countries, between industry and consumers, between large corporations and SMEs. And in the same way that environmental regulations were installed in the second half of the 20th century to protect the environmental commons, it is increasingly asked whether additional regulations are needed in the IP system to protect the knowledge commons. If a company can take out a patent on a common activity – such as the way a consumer interacts with a business – there is a danger that the public at large will start to see the IP system itself as flawed. Awarding this type of patents may only have small effects in the short term – but it sets precedents that may have far bigger cumulative effects over time.

Society creates knowledge

Ownership isn't the only problem. The development of the so-called 'Web 2.0' has increasingly blurred the distinction between creators and users of IP, further undermining conventional regulatory responses. Could Wikipedia retain the support of its countless contributors if its 'owners' asserted any kind of IP ownership of the content on the site? We're seeing the re-emergence of the 'citizen innovator.'[53]



Above: The past couple of years have seen rapid growth in public interest in intellectual property – and institutional reaction to that interest. Arguments in the debate can be broadly classified as extrinsic or intrinsic to the intellectual property system.

> **"The patent system should first of all find a means to protect the free development of a basic knowledge base, so that these building blocks of information are freely available in the public domain."**
>
> **Professor Jens Erik Fenstad**, Chairman, World Commission on Ethics of Scientific Knowledge and Technology (EPO Interview)

In 1997 Amazon submitted the business method patent to register its '1-Click®' ordering system. As soon as US Patent Number 5,960,411 was granted, Amazon successfully sued Barnes & Noble.com for infringement.

In *Open Innovation: the new imperative for creating and profiting from technology*, Henry Chesbrough says that open innovation based on 'creation nets' involving hundreds or even thousands of 'creative citizens' [54, 55] doesn't fit well with classic definitions of IPR. Companies therefore increasingly rely on secrecy (as well as customer relationships, branding, design complexity and first-mover advantage)[56] to secure their positions – which also has negative connotations for society. Open source models appear to create closer consumer relationships and the opportunity to harvest creativity that's evolving in social creative communities.

The tech backlash

In any case, not every part of society wants to be part of this fast-changing world. Novel technologies increasingly incorporate scientific uncertainty, and that worries many people. The 2006 report of the Pew Internet & American Life Project asked technology stakeholders to answer several questions on likely future directions for technology[57] – 42% of them agreed that "by 2020, intelligent agents and distributed control will cut direct human input so completely out of some key activities… that technology beyond our control will generate dangers and dependencies that will not be recognised until it is impossible to reverse them."

Almost half the respondents disagreed that the internet's inherent "transparency [will] build a better world, even at the expense of privacy;" and 58% agreed that "by 2020, the people left behind (many by their own choice) by accelerating information and communications technologies will form a new cultural group of technology refuseniks who self-segregate from 'modern' society. Some… will commit acts of terror or violence in protest against technology."

This unease has filtered back to the IPR system, which is perceived as both the official authoriser of suspect technologies, as well as the enforcer allowing companies to profit from them. In any case, the patent office is a convenient lightning rod or surrogate target when the organisations engaged in 'technological advancement' are so diffuse.

Knowledge: life and death

But the most significant societal threat to the existing patent system is probably around the life sciences. One issue is the extension of patents to include genes and living organisms (as we'll see later). Secondly, the spotlight has fallen on patents in the debate on the failure to provide affordable medicines in large numbers to vulnerable populations – or in charging social healthcare systems huge amounts of money for treatments. Unlike the software sector, the pharmaceutical industry relies heavily on strong IPR, particularly patents. Chemical compounds in new drugs have to be disclosed for regulatory purposes (denying the developers secrecy) and are, in most cases, easy to reverse engineer. And no pharma company would be prepared to fund costly clinical trials without being able to claim exclusive rights due to the likelihood of free-riding.

But the pharma industry has been criticised for demanding high prices for patented drugs even though there are large financial risks developing and marketing them.[58] At the same time, competition from generics, parallel importing, counterfeiting problems and growing societal risk-aversion (leading to increased costs of clinical trials) have had an impact on their business model.

The result? First, greater inclination by the pharma industry to provide products offering safer returns on investment – for example, 'evergreening' (tweaking established compounds to create patentable variants from existing R&D) or focusing on diseases prevalent in rich countries. There is genuine concern that the pharmaceutical pipeline for new antibiotics is drying up, despite the emergence of highly resistant bacteria strains,[59] and similarly, concerns over the neglect of R&D into diseases affecting mostly the developing world.[60] Second, reliance on extended patent protection (for example, the Hatch-Waxman Act in the US[61] and Supplementary Protection Certificates in Europe)[62] and data exclusivity for clinical trials.[63] Critics claim that this has decreased innovation – to society's detriment – and that the pharma industry is investing far more in marketing, leaving the most important

Open innovation, theory and practice

Push systems	Pull systems
Demand can be anticipated	Demand is highly uncertain
Top-down design	Emergent design
Centralised control	Decentralised initiative
Procedural	Modular
Tightly coupled	Loosely coupled
Resource centric	People centric
Participation restricted (few participants)	Participation open (many diverse participants)
Focus on efficiency. Limited number of major re-engineering efforts	Focus on innovation. Rapid, incremental innovation
Zero-sum rewards (dominated by extrinsic rewards)	Positive-sum rewards (dominated by intrinsic rewards)

Source: John Hagel III and John Seely Brown, From Push to Pull[64]

Above: Supply, or 'push', measures see industry, governments or funding agencies actively support certain directions in R&D. Demand, or 'pull', measures are exerted by the market which demands certain products or innovations and thus creates an incentive for R&D.[65] An example of open innovation in the pharmaceutical sector is InnoCentive, a subsidiary of Eli Lilly, which is "an exciting web-based community matching top scientists to relevant R&D challenges facing leading companies."[66]

innovations to public sector agencies. Strong patent protection and a partial lack of competition in this field might have contributed to these repercussions.[68]

Solutions in health

Setting the right incentives for innovation in pharmaceuticals isn't easy.[69] Non-governmental and philanthropic organisations supported by international agencies (WHO, UN) or private benefactors (such as the Bill And Melinda Gates Foundation) are starting to set the goals for research and provide funding in these areas.[70] In both the US and Europe, additional incentives have been introduced to encourage research into 'orphan drugs' for less prevalent conditions either by reducing the risk of R&D (with tax credits, grants and support for clinical trials) or by increasing drug profitability with tax breaks or extended monopolies.[71]

Other global frameworks which replace patents by prize funds[72] or advanced payment schemes have been proposed,[73-77] but they would all see greater influence of politics on research priorities, which many see as a great disadvantage.[78] Some economists have argued for a pure market system, claiming that high demand for a newly invented product immediately after its introduction should generate sufficient profits to sustain the incentive to innovate, even if, over time, imitators release copies.[79] Other commentators have argued for a zero-cost compulsory licensing scheme[80] or an auction system[81] in which patents granted by the authorities must be submitted to an auction where most of them are purchased by the government and placed in the public domain.

So far, society's protests against costly patented drugs have been isolated – court cases in Britain over access to cancer drugs, for example.[82] But the threat of a global pandemic may well be the breaking point for IP in health.[83] If mass inoculation or treatment is required not only to save the lives of the afflicted, but also to sustain social cohesion itself, it's not hard to imagine that over-exploitation of patented medicines by the companies that develop them will tip society into open revolt.

Food rights

Food is an even more basic human need than medicine – and it's another area where society's discontent with existing IP behaviour is weakening faith in the system.

In 2005, around 150 crop species were cultivated worldwide. But most of mankind lives off no more than 12 plant species. A small number of carefully developed, standardised, high-yielding varieties[84] dominate farm output. It's estimated that just 10 multinational corporations control nearly half of the global seed market.[85] That concentration appears to have caused a reduction in research activity in the sector[86] – further limiting plant diversity and increasing the risk that pests or disease might one day damage substantial proportions of at least some crops.

Why blame IP?

Whether or not the patenting system is at fault for a failure to get drugs to those who need them is immaterial. Blame is laid at the door of the IP system by many forces in society.

"There are some examples of medicine patents, on AIDS or other pandemics, where national health infrastructures cannot meet the costs of medicine and blame the patenting system for the high costs," says Professor Jorge Amigo, Director General of the Mexican Institute of Industrial Property. "This is not true, and there is a clear need to review what the patent system is and which ethical controversies are not caused by the patent system." (EPO Interview)

"Current rules must be constantly reviewed to eliminate the loopholes which undermine the fragile balance between legitimate IP rights and the imperative to ensure a continuous supply of competitively-priced generic medicines."[67]

Greg Perry, Director General of European Generic medicines Association (EGA)

Right: "There is a resentment of an increasingly industrial or very commercial model of innovation and creativity: intellectual property as a cultural institution becomes the target for this problem." **Johanna Gibson**, Reader in Intellectual Property Law, Queen Mary, University of London (EPO Interview)

A number of (often parallel) IP regimes exist for the protection of plants and plant parts.[87] Plant varieties can be protected in many countries under UPOV, the International Convention for the Protection of New Varieties of Plants.[88] And the TRIPS agreement allows members to exclude plants from patentability if another effective sui generis system is available[89] (resulting in a big increase in the membership of UPOV).

While in the patent law of most countries, prior use is recognised as prior art and therefore existing plants or traditional knowledge are not patentable, US patent law only refers to prior use 'in the country.' So if a plant or traditional knowledge outside the US is not documented it may be patentable in the US (such as Mexican Enola beans[90] or Indian basmati rice),[91] causing huge international discontent.

India has adopted its own sui generis system which goes beyond UPOV and contains provisions for 'benefit sharing': local communities are acknowledged as contributors of the plants.[92] In Japan, Australia, and New Zealand patents are available for plants.[93] In Europe plants are patentable if no varieties are claimed.[94] But none of the systems has been wholly successful in preventing controversy around IP and food. GM crops are the subject of huge social disquiet – even civil disobedience – and patents are seen as helping them into the markets. The protection of plant-related inventions is sometimes associated with cases of bio-piracy – the appropriation of genetic resources and traditional knowledge for commercial gain. And the sequencing of plant genomes by seed companies – for example, rice by Syngenta – has led to concerns about the public accessibility of the resulting data. In the Syngenta case, the company released the complete data after fierce protest by scientists all over the world.[95]

Patenting 'Life'

Many sections of society see the whole practice of 'patenting life' as unethical. This was the subject of a major challenge by NGOs and churches to the EC Directive on biotechnology patenting in the 1990s.[96]

"We have received seeds from nature, and our duty is to save, conserve and exchange these seeds," says Dr Vandana Shiva, Director of the Research Foundation for Science, Technology & Ecology in India. "Laws that work against nature are unnatural. The concept of allowing patents on life has caused ethical outrage. Life was not invented, so the concept of claiming exclusive rights to it is unethical, and this ethical issue has been translated into legal issues. The fact that there is a Monsanto patent on a gene has raised serious issues."[97]

The industrialised world made a promise to open up agricultural reforms in return for developing countries' acknowledgment of IP rights, but this has not happened. **See page 59**

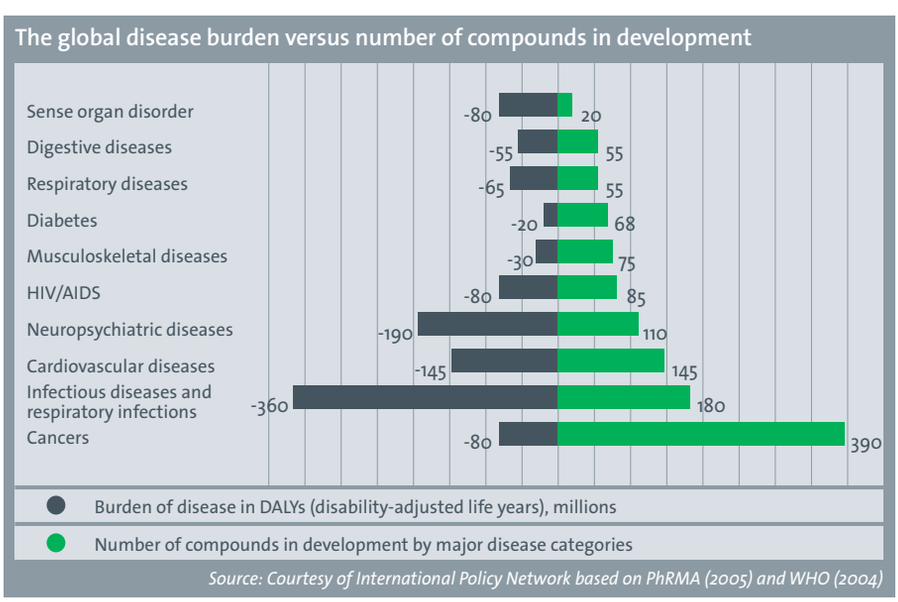
Because life obeys its own rules – even if it's patented – it's possible to infringe on related IP rights quite accidentally, as Percy Schmeiser did (see box, page 79).

Playing God with IP

There is little evidence that any of the major religions has principal objections against IP per se.[98, 99] But some Christian churches have repeatedly stressed that patenting of genes, parts of the human body, plants or animals is considered as an appropriation of God's creation.[100-102] There are religious groups that perceive some technologies as immoral[103, 104] or intrinsically unfair on social and economic grounds.[105, 106]

The Conference of European Churches was not opposed to biotechnology or the patenting of biotechnological inventions in general, but expressed their "profound objection to living organisms being patentable in themselves," and stated: "We believe that these are ultimately as much God's creation and products of nature as we are ourselves, and are therefore beyond any claim to be human inventions."[107]

Religion can also have an indirect impact on IP by influencing the way scientific theories are accepted in society – the most high-profile



Above: R&D follows the money, not the disease High-profile diseases afflicting Western countries tend to attract the highest levels of research (as measured by the number of compounds in development). There is a particularly disproportionate level of research into cancers, diabetes and musculoskeletal diseases compared to their impact. Infectious diseases, which are particularly prevalent in the developing world and cause by far the highest disease burden, ranks a distant second to cancers in terms of R&D.

Strong patent protection and a partial lack of competition in this field might have contributed to society's unease with 'big pharma.'

The challenge is going to be ensuring that developing countries have access to generic medication. We are also going to see challenges in the developed countries, around the expense of drugs that cost tens of thousands of dollars or more annually or this will create pressure to modify patent laws to generic versions of these drugs.

Professor Joel Lexchin, School of Health Policy and Management, York University, Canada (EPO Interview)

example being the debate about the teaching of Darwinism in US schools.[108] A new coalition between scientists and fundamentalist Christians in the US might emerge around the topic of environmental protection, in particular with regard to biodiversity.[109] As scientific advances in human genetics accelerate, the debate is bound to intensify.

Genetic IP: a new dimension

Society's trust in technology is being stretched: it fears diseases and environmental degradation as well as new developments (for example, genetically modified foods). So it's no surprise that granting IPR, and therefore opportunities for commercial exploitation, over gene sequences is a flashpoint.

But the question of the appropriation of genetic information – and the resultant economic and social consequences – has also been raised. Gene sequences are difficult, if not impossible, to 'invent around' because there often is no alternative that would serve the same purpose.[110, 111] This issue came to a head in the debate on the breast cancer genes BRCA1 and BRCA2. They were patented by Myriad Genetics which then limited other laboratories from carrying out the tests for the disease. The case demonstrated that monopolies in this field carry the risk of increasing the price of tests and blocking further innovation.[112] And, of course, patent thickets and royalty stacking are likely where several genes or mutations are required to perform a test.[113]

Although European legislation has been more circumspect on issuing patents for gene-based innovations than the US, applications have soared at the EPO, too.[114] Ethical concerns expressed in both national and EU political forums (as well as legal measures) have helped keep grant numbers low.[115, 116]

In fact this ethical debate – running in parallel with a practical argument about the tests for, and application of, such IPR – has been raging at least since the development of the Oncomouse in the late 1980s (see box, opposite). It was patented in Europe in 1992, a historic moment according to Greenpeace patent expert Dr Christoph Then. "An intellectual property monopoly given on a creature defining it as a technical invention… raised widespread debate among the many stakeholders in society," he says.[117]

By 1993, it was clear that there were no easy answers around IPR on life-forms. "We are now at a crossroad and we must know where do we draw the line regarding gene patentability and the use of patented products," said Professor Alain Pompidou at the time (he was then an MEP).

He was arguing even then that patents do have a role to play in advanced bioscientific fields; and that patent offices probably ought not to consider ethics, as such, as grounds to reject patents. "Advances in science and medicine make it necessary to lay the foundations for a new social contract," he concluded.[118] But as the perceived gatekeepers or enablers of this science, the IPR regulators have been drawn into the debate.

Can IPR keep up with science?

While the debate was evidently heated in the 1990s, it is a matter of some urgency in the 21st century. The technology is moving on: prostheses are becoming more and more sophisticated; neuron-chip interfaces are being developed; genetic testing is improving and genetic selection has been approved by legislators under some circumstances.[119] As a result, the public's unease is intensified.

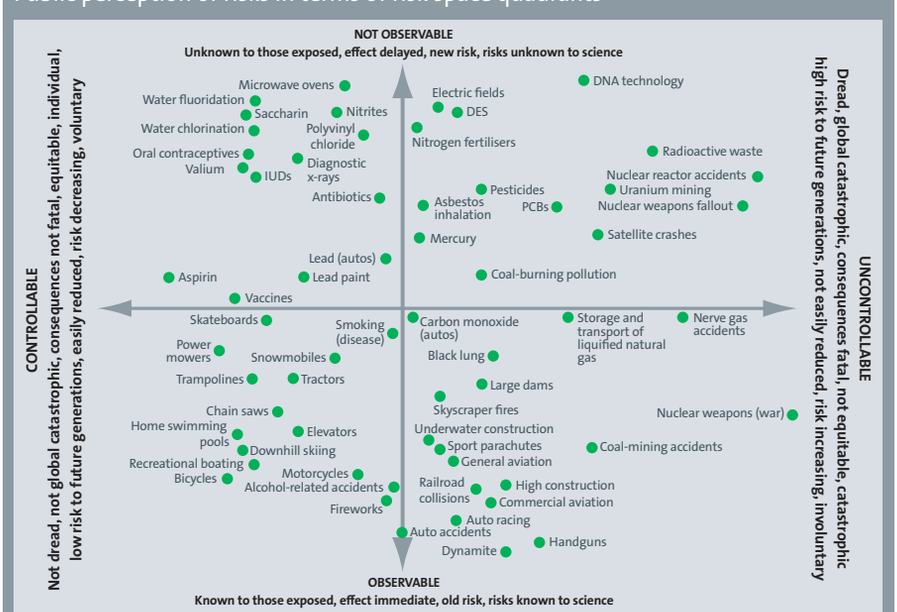
The most likely of those controversial techniques to be adopted in the near future are probably the selection of embryos based on genetic criteria and cloning. The UN has adopted a legally non-binding declaration that asks governments to ban human cloning, but several states have declared that they will not adopt it because of interest in embryonic stem cells generated by cloning techniques.[120] And with increasing 'medical tourism,' it is difficult to imagine how national or regional legislation could prevent patients with a need for treatments based on controversial research travelling to areas of the world where the medical regulators allow such treatments. It will be difficult to design an IP system that caters for both those who are uneasy about these technologies, or who have ethical concerns, and those who would seek out treatments based on them wherever they can.

Elusive answers

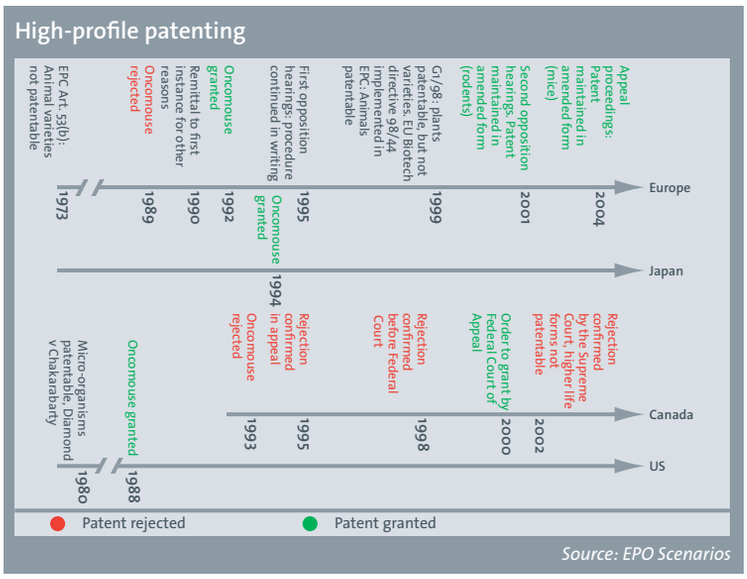
It is difficult to gain any consensus as society is fundamentally fractured. Whose values take precedence? Which outcomes are most desirable when setting the IPR agenda? Should the ethical concerns of one group outweigh the desire for gene-based treatments or new crop varieties by other groups? As more people are educated and question 'received wisdom' – and lose trust in institutions – those who set and enforce policies are in a lose-lose position.

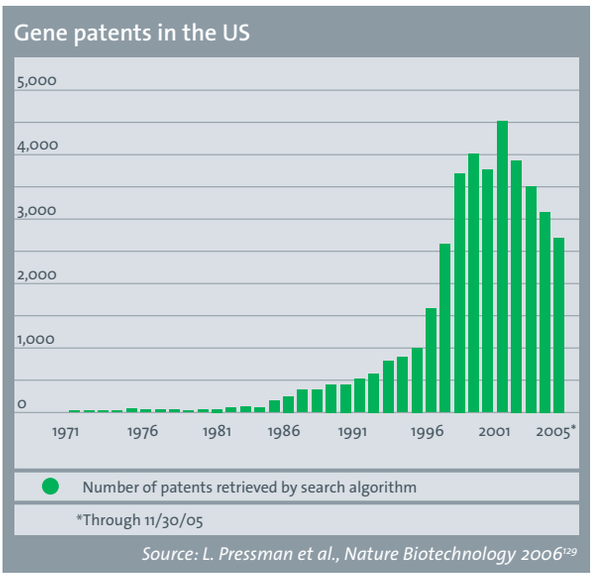
Right: Society tends to perceive risks differently. Familiar risks are not viewed as risky as complex, ubiquitous risks with high scientific uncertainty over which society has little control, e.g. nuclear energy, GMO. As our capabilities in these new fields grow, and as the effects of human action on the environment become clearer, this disquiet may well spill over into activism and even violence.

Public perception of risks in terms of risk space quadrants



Source: Slovic, P, B Fischhoff, S Lichtenstein[121]





Above: High profile patenting The Oncomouse – a mouse genetically designed to get cancer to aid studies of the disease – was developed by researchers at Harvard University and Du Pont. But although in the US, the patent was largely uncontested, the European patent was opposed by 17 different petitioners, mostly under Article 53(a) of the EPC which excludes "inventions, the publication or exploitation of which would be contrary to 'ordre public' [public order] or morality." In November 2001, the patent was amended and then upheld, a decision confirmed on appeal in 2004. But in Canada, the patent was eventually overturned in the Supreme Court.

Above: According to research published in *Science* magazine in 2005, almost 20% of human gene DNA sequences have been patented in the US – 4,382 out of the 23,688 known human genes.[125] Gowers review noted, "the construction of [gene] databases often requires substantial resources and so there would be no incentive to invest without legal or technical ways to prevent others from copying the information. [But] the line between what is created and what is discovered has been hotly contested."[126]

Worse still, regardless of the local or regional rules of patentability, if IPR are seen to be blocking a 'social good' (or empowering a social ill), the system will lose the support of society. Dr Sandy Thomas, Director of Nuffield Council on Bioethics, thinks that to close this gap there needs to be a more conclusive debate about the IP regime's relationship to 'the public interest.'[122]

In 2005 the European Parliament called "on the Commission to continue monitoring developments, taking into account both the ethical aspects and the potential impact on the accessibility and affordability of healthcare and competitiveness;" and requested "the European Patent Office to set up a further body which, because of the sensitivity of the issue, checks patents that are sensitive from an ethical point of view before they are granted."[123]

It remains to be seen whether a single IP regime – or, indeed, any IP regime – can solve the problems of competing demands from the developing and developed worlds, the rights of companies against the rights of society, the march of technology versus concern for the rights of humanity.

"Decisions about intellectual property are about much more than simply finding ways to stimulate and reward innovation; they are also about accountability, control, and governance," says Prof Hilgartner of Cornell University. "There is little hope of developing acceptable intellectual property without finding new ways to ensure broader participation in policy making and creating new mechanisms to address the deep politics of this increasingly important domain"[124] ■

Non-wilful IP infringement[127]

"For seven years, Percy Schmeiser has argued that seeds from Monsanto's patented genetically-modified canola landed on his 1,400 acre farm near Bruno, east of Saskatoon, by accident. Monsanto has altered the plant's genes to make the canola resistant to *Roundup*, a Monsanto weed killer. Monsanto patented the gene and the process of inserting it into the seed. [...]

Lower courts rejected Schmeiser's claim that the canola landed on his fields by accident, but didn't deal with the deeper issue of whether Monsanto can control use of a plant because it has patented a gene in the plant. But Canada's highest court sided with Monsanto – in a five to four ruling. The court did agree with Schmeiser that the plant is a higher life form and cannot be patented, but said the patent does apply to the gene. [...]

The ruling forces Schmeiser to turn over any remaining crops and seeds derived from Monsanto's product. But the court overturned a lower court ruling that he pay Monsanto the profits from his 1998 crop."

Percy Schmeiser's battle, CBC News Online, 21 May 2004

Photo: Nature Biotechnology[128]

TREES OF KNOWLEDGE SCENARIO: THE JOURNEY TO 2025

In the year 2025, patents have survived only in some traditional fields such as mechanical and chemical engineering. Most patent offices have closed or changed into so-called Knowledge Agencies (KAs), dealing with the implementation of the various innovation incentive programs and providing support for academic researchers and SMEs. How did this massive change came about?

Even by 2007, there was growing concern about the public's ability to access and use materials in an increasingly digital world. Copyright and related rights were seen as being used to protect old business models, restrict innovation and limit access to the building blocks of the knowledge economy. Questions were increasingly asked about the benefits of existing laws and opposition grew to attempts to extend protections. Legislators were criticised for siding with big business, making laws to suit the CEOs and to please shareholders who, ironically, often were people's own pension funds. The world had been swamped by a flood of trivial patents and excessive copyright which many started to consider as a 'pollution' of the system. Only some investors and a rapidly growing patent profession were profiting from the rising number of litigations and patent suits.

Civil society groups, sometimes working with like-minded businesses and governments, at local, national and international levels started to network, joining forces in a very flexible way using the internet. Local interest groups could easily contact like-minded organisations on the other side of the world to fight joint battles against their common enemies.

They would fight a case – in the streets, in stores, but also in the courts, armed with information gathered by globally distributed teams of researchers – and then break up again to join forces with others for new battles. Many were united by the common theme of public access to knowledge (A2K) and access to medicines and food. By 2010, this broad alliance was as big and well organised as the environmental movement in the second half of the 20th century, with which it shared many causes.

Anti-IP 'pirate parties' fielded enough candidates to receive TV and radio airtime and ensured that the IP message became a political issue for the public and mainstream parties. (The 'pirates' all but disappeared after a terrible performance in the European Parliament elections of 2014, when their agenda had been almost totally hijacked by other parties).

The vast majority of the public no longer saw patents and copyright as incentives for innovation and creativity. New methods of information-sharing had proved better adapted to the 'knowledge economy' and the ever-increasing speed of technological change. Concerns over access, security and archive retrieval saw governments increasingly mandating open format software for official communications. After a series of buggy releases and use of over-zealous digital rights management systems by the big software operators, by 2012 a majority of the world's new computers and smart-phones ran on open source software.

These new innovation models also seemed to serve the needs of society better. The open source movement had started in the software sector but rapidly gained influence in other areas such as biotechnology, agriculture, environmental technologies and telecoms. Clever companies had included their consumers in the development of new products and technologies. The inflated IP system of those days was perceived to be solely driven by financial interests – and to serve the interests of society less and less.

But it was a few catastrophic events that finally led to the restriction of patenting in many technical fields in most industrialised countries.

The single most important event was the disastrous flu pandemic that arose in Indonesia in 2012, then spread rapidly. In a few months the pandemic killed nearly 20 million people, not only in Asia and Africa, but also in Europe and America; it had serious consequences for the world economy and destabilised global financial markets.

The crisis also severely damaged people's trust in the patent system. During the initial outbreak companies refused to lower the prices of existing vaccines and refused to allow generic manufacturers into the market. Complicated overlapping IP rights on different mutant variants of the flu virus severely hampered research into vaccines and therapeutics targeted to the precise strain of the virus. Vaccine developments were delayed by several months.

Governments were blamed for allowing a patent system that reinforced this 'immoral' behaviour of the pharma industry, and for not having established alternative public research programmes.

Generally there was increasing strain on health systems and employers' drug budgets. Pharmaceutical companies were also attacked for having focused on life-style drugs (such as Sildenafil for male erectile dysfunction and Orlistat for obesity), 'me-too' drugs and cures for an ageing population in the industrialised countries.

Demonstrations took place in front of patent offices all over the world with slogans like "Patents kill." In spite of fierce protests from the pharma industry, governments reacted: first they granted compulsory licences in the interest of public health and broadened research and clinical trial exemptions. In parallel, patent grant numbers were limited to ensure that only the most 'inventive' ideas would receive a monopoly protection. All this led to a further shift of pharma industries' investments away from areas crucial for public health. But other industries also responded by shifting their investments to IP-insensitive areas. The risk that they may never recoup their investment in those 'hot' areas was simply too big.

Finally governments in many countries replaced patents on medicines with a government regulated system that allowed companies that performed clinical trials of drugs (the really costly bit) to sell their results to other companies wanting to market the same drug. The price for such transactions was fixed in relation to the estimated public health benefit. At the same time, human genes, stem cells and other parts of the human body were excluded from patentability. A massive boost in the amount of government funded research, prize funds and public-private partnerships attempted to fill the gaps left by the pharma industry's lack of interest.

The pharma industry instead started to offer tailored pharmaceuticals. Wealthy patients were asked to send in their individual genetic profile and a specific medical programme suited just for this individual and his or her personal needs was developed.

In 2018 a major part of the worldwide maize and soybean harvest which was already drastically affected by worldwide droughts was destroyed by pests which had evolved under the changed climate conditions and infected the few varieties that dominated the market. The alleged pest resistance of these genetically modified varieties and their higher yields had made farmers and agri-corporations complacent – and so the new pest found doors wide open.

Foot shortages arose in several parts of the world – and again, prompted by mass demonstrations, governments were forced to step in and limit monopolistic practices in the seeds business. Broad breeders exemptions were introduced to enable farmers to cross their local varieties with the dominating high yield ones and thus increase the diversity of available food crops. In addition, governments now invested heavily in research for drought- and pest-resistant food crops to counteract the increasing effects of climate change. The results of this research remained in the public domain.

The information and communications technology (ICT) industry, of course, had already been through a similar process by then. People had been complaining about high-tech patents back in 2007: established ICT standards had been attacked by patent 'trolls' (many of them venture capitalists that had discovered IP as the ideal way to exploit the knowledge economy) who produced no products but profited from lawsuits against successful IT companies.

After several independent economic studies showed the questionable social benefit of patents in areas of fast-moving technologies, even the business community – those that actually innovated and made products – turned against the patent system because of its abuse by patent trolls.

Thanks to coordinated lobbying from consumers and businesses, the power of trolls was limited by the introduction of clear rules that prevented abuse of patent rights through injunctions. But, for a number of reasons, patents were becoming less important in the ICT industry. Besides the fact that they no longer served the interests of the most fast-moving parts of the industry, they had also acquired such a negative public image that companies preferred to stay away from them and (if open source was not an option) to resort to other protection mechanisms such as secrecy or private contracts.

IT companies started to offer personal assistant programmes tailored towards the needs of each individual, group (particularly the large segment of the elderly) or company to help them to use IT services more effectively and efficiently. Information brokers assisted by Artificial Intelligence and Expert Computer Systems became a new niche for IT companies.

Much the same thing was happening in the entertainment industry, which had tried for several years to enforce its IPR through copyrights and digital rights management (DRM) against an ever-increasing flood of file sharing. Around 2014, many new entertainment enterprises had evolved that were better adapted to the new situation: they used their first-mover advantage and consumer-oriented services to generate revenues. They focused power in the hands of artists, selling them (rather than the consumers) add-on services such as web hosting, marketing, tour support and networking opportunities. Slowly the 'old-fashioned' industry – based on big-money album deals and multi-million dollar back-catalogue exploitation – disappeared.

But entertainment seemed a trivial battleground by 2020. After several years of active genetic selection of embryos, research into the alteration of the genetic and cognitive make-up of human beings started to be openly advocated. Naturally, there was massive opposition – and not only from religious groups. But research in so-called 'sensitive' areas simply moved to parts of the world where public climate, local IP protection and research funding were favourable. The constant battle over the opportunities and risks of new technologies became a continuous background noise reflecting different values and views around the world.

The IP World in 2025

After a long period of diminishing significance and despite efforts to increase quality and raise the 'inventive step', patents have largely been abolished in most technical fields worldwide.

Copyright has also been heavily reformed. Sharing information is the norm – content creators find value in their networks and recognition from peers; businesses are built on providing supplementary services and added value to the user. Open source, creative commons and science commons are the standard forms of protection for work and attributions of authorship.

In business, secrecy, trademarks, design rights and geographic indicators are now used to protect innovations. First-mover advantage and customer relationship management are the prime differentiators between the successful and unsuccessful.

Innovation is further encouraged by state and NGO funding. Public private partnerships, prize funds, advance payment schemes and outright government grants ensure true innovators – working for the public benefit – are handsomely rewarded. This also ensures that pharmaceutical research is focused on the most important areas relevant to public health. However, distribution of the (limited) resources is strictly efficiency controlled and aims to achieve the biggest overall health benefit. Rare diseases or life style related conditions are not first priority.

Former patent offices have an important role to play in providing information about the different incentive systems in place (in particular to SMEs) and in evaluating grant and prize proposals. They also provide a platform for public private partnership negotiations. Hence, their new name: Knowledge Agency (KA).

There is practically no litigation around patents; enforcement is considered pointless.

Nevertheless, the absence of a profit motive has reduced innovation levels in certain domains (particularly biotechnology, where social concerns also limit the availability of governmental incentives). Increased use of secrecy to protect innovation has slowed the rate of cumulative innovation in areas where open source has proven impossible, a major disadvantage for small, highly innovative companies.

And because research priorities are now politically driven, we live with the ever-present danger of capture; strong lobbying by the R&D-focused companies for state hand-outs is having an effect on the neutrality of politicians. And the government is not always successful in planning and directing research.

Above: Demonstration at the EPO in Munich, 2002. Photo: Danielle Vochims, EPO

KEY QUESTIONS

- **How can public and private interest in IP be reconciled for the benefit of society?**
- **How are the ethical and moral dilemmas raised by technology reflected by the patent system?**
- **Where should the limits to patentability be drawn? By whom?**

The King was lucky: the tribes of his kingdom had explored all his lands to bring him great riches and knowledge. The mountain people used their ropes to climb the highest peaks. The river-dwellers built boats to explore tributaries and deltas. And the desert nomads had learned clever ways to conserve water for long journeys.

He knew that there were many more lands that might hold greater wealth and wisdom. He issued a proclamation: "All the peoples of my kingdom shall compete to discover new territories. Those that bring back knowledge and treasure will have half the share!"

The river-dwellers were overjoyed. "With our ships, no one can beat us to the new lands," said their chieftain. Two months went by, and finally one of the ships returned. But there was no gold or treasure. "We sighted land, but were running short of water so returned home empty-handed," said the captain. The river chieftain would not give up though. He went to the desert nomads. "Give us the secret of water storage so we can try again," he said. The nomads scoffed, "What's in it for us?" "We will give you a third of all the treasure," he replied and the deal was done.

Three months went by before the ship returned. "We spent a month seeking an inlet," said the captain. "But there was none, and we had no way of climbing the cliffs. Our food ran out and we had to return." "Let us try, using your boats," said the prince of the mountain people. "We can make food last, and climbing cliffs is easy!" The King agreed – but the river-dwellers refused because they could not agree how to share the spoils.

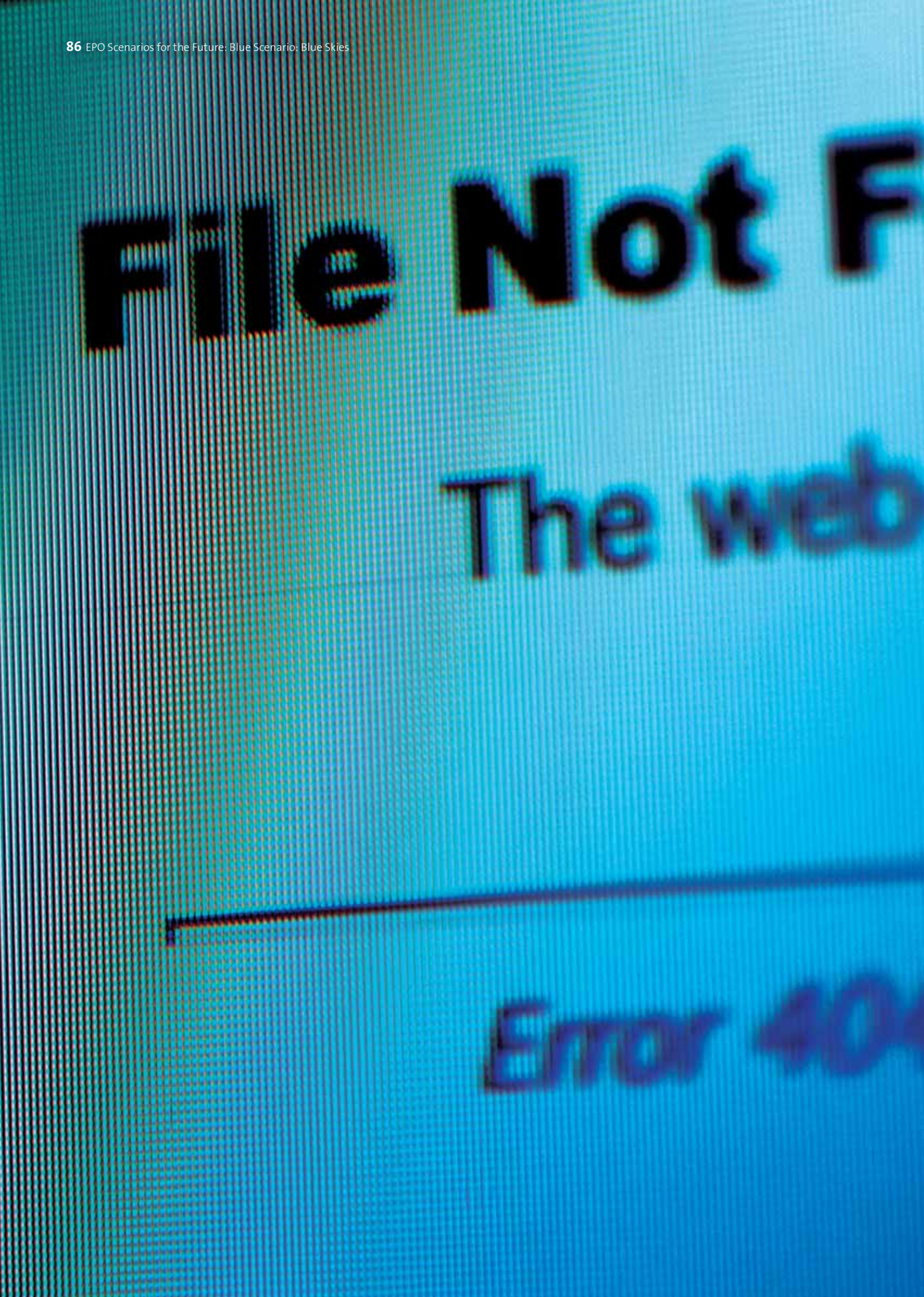
Years passed. The kingdom grew weary of disputes, and because the tribes spent all their time trying to discover each other's secrets, they let hunger and disease spread across the land.

Finally the King had had enough. "I shall lead a new expedition using ships from the river people, we shall take nomads to store our water and mountain people to scale the cliffs. All our skills shall be used – and all of us shall reap rewards from the new lands we discover!"

The mission succeeded. They returned with food, medicines and new allies from the far-off lands.

Moral: In quarrelling about the shadow, we often lose the substance.

BLUE SKIES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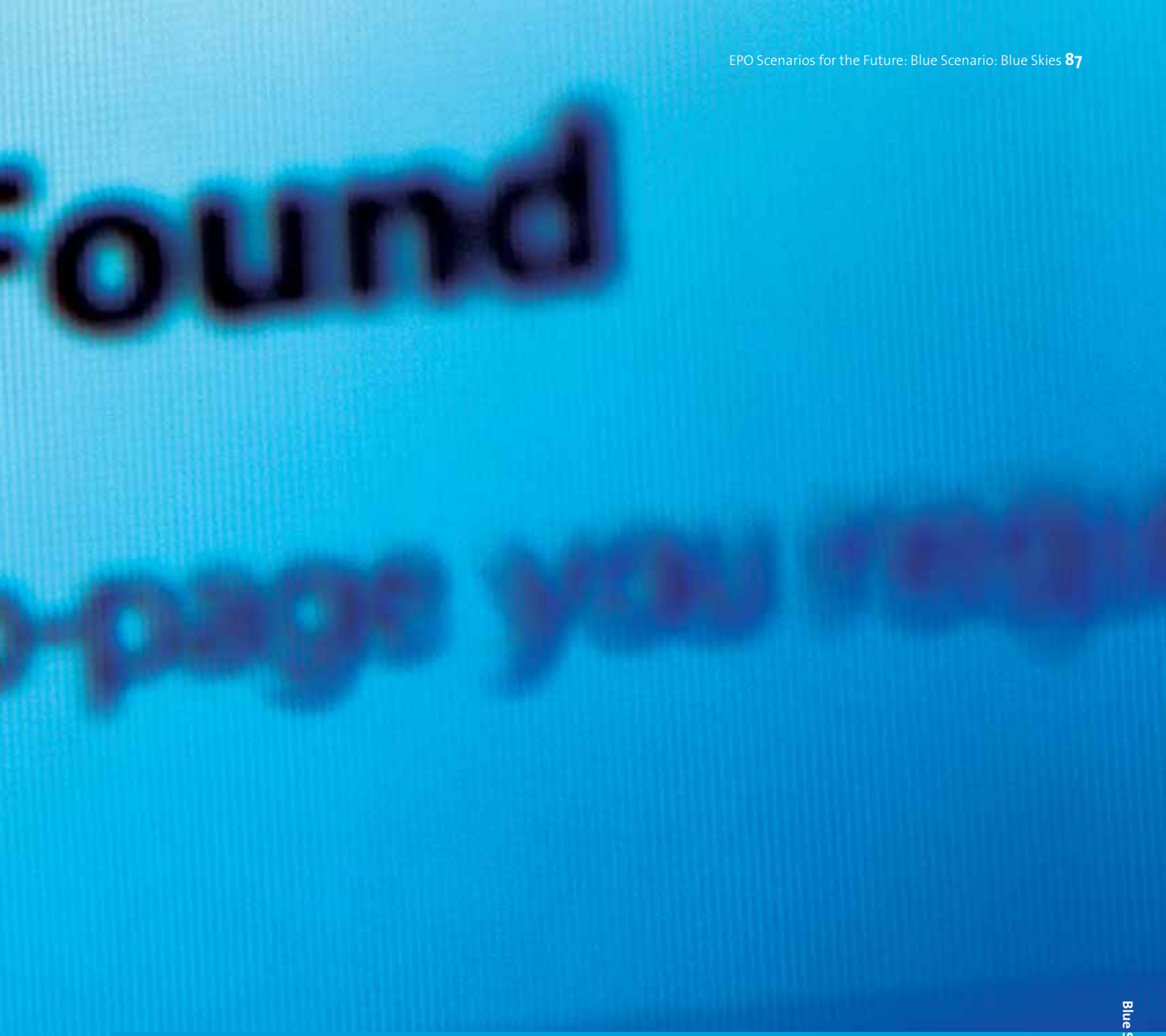


BLUE SKIES

The story of differentiation in the face of global systemic crises, where Pace of Change, Systemic Risks and Knowledge Paradox (as the nature of knowledge changes) are the major driving forces.

The evidence that points to this scenario is...

Mankind's first technological steps were the production of sharp-edged tools, the control of fire, and the invention of the wheel. It took our species tens of thousands of years to reach each of those pivotal discoveries. But by AD1000, each paradigm shift in inventiveness required only a century or so to come about. And the acceleration since then has been exponential: in the first 20 years of the 20th century, technological advancement exceeded that of the entire 19th century.

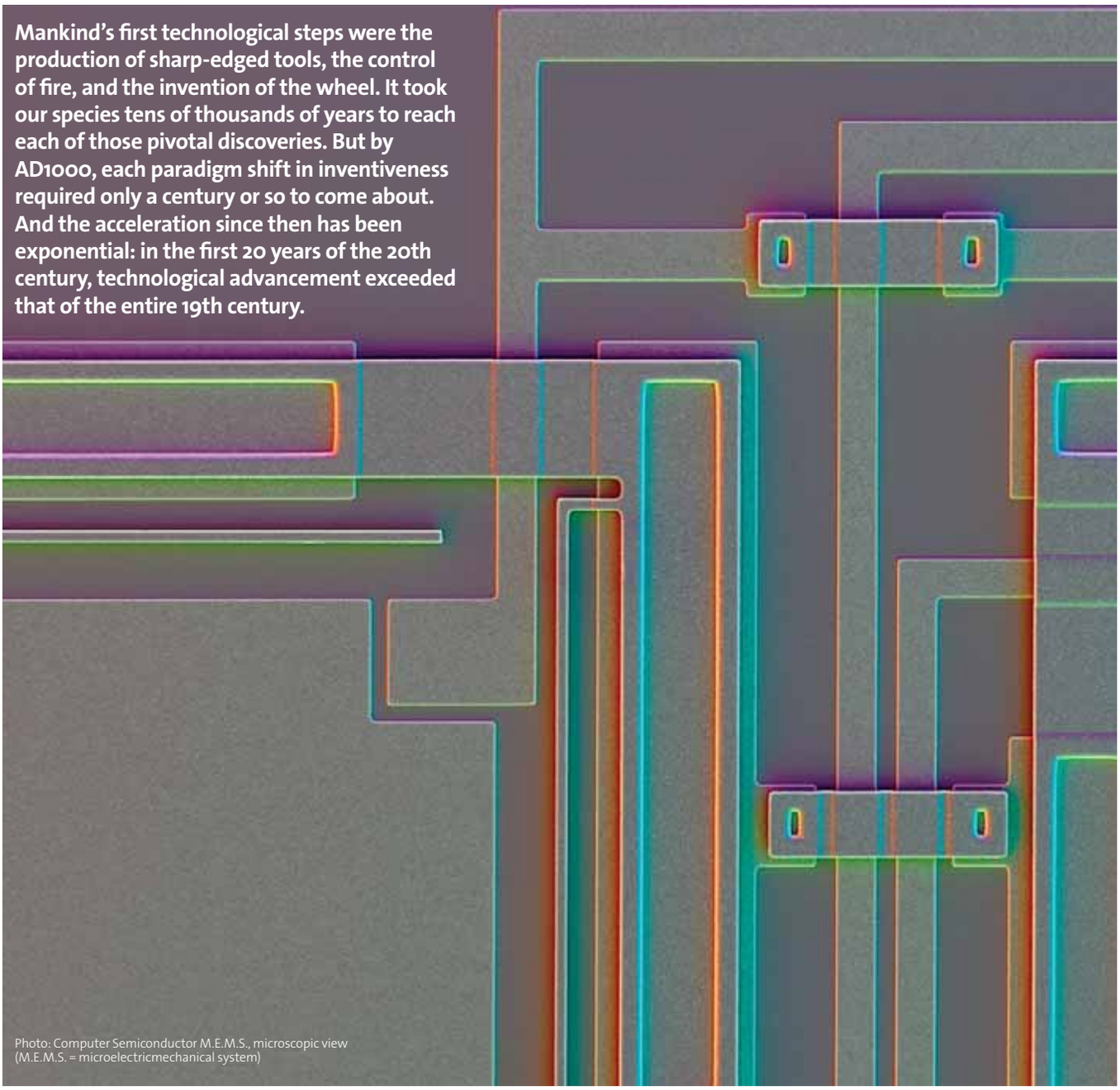


Photo: Computer Semiconductor M.E.M.S., microscopic view (M.E.M.S. = microelectricmechanical system)

Even 40 years after Gordon Moore first explained his law for developments in microchip technology (a doubling of capacity and halving of cost every 12 to 18 months),[1] the pace of change shows no sign of slowing.[2] It may even accelerate as different technologies cross-fertilise, creating exponentially higher numbers of potential inventions[3] and increasing complexity.[4] For example, we're now seeing rapid advances in the development of nano-enabled drug delivery systems – combining pharmaceutical, engineering and computer technologies.[5]

The speed of technological diffusion

All technologies have a life cycle. Invention, which takes time and effort; development – the crucial stage, where some technologies find applications but most don't; maturity, when a technology becomes interwoven into the fabric of life; challenges, when new inventions compete with it (although most of these will fail); gradual decline, as some challengers succeed; and surrender.

Diffusion is the process whereby an invention is adopted and gains societal acceptance.[6] Some of the factors that influence this process are the invention itself, how information about it is communicated, time, and the nature of the social system into which the innovation is being introduced. The speed of technological diffusion is accelerating, with product life cycles of less than two years now prevalent in certain technological areas.

The new cumulative innovation process

The way invention happens has changed, too, with a shift from individual to global production fostered by advances in ICT; the 'flashes of genius' has largely been replaced by a collaborative approach.[7] Knowledge no longer is produced in relative isolation: in many technical areas, such as the software and the computer industry,[8] it is produced by way of a highly cumulative innovation process.[8, 9] This allows the creation of truly complex products, each one made up of a large number of individual pieces of generally interoperable components.[4] These complex systems and devices are much less likely now to be stand-alone products or 'silos' created by a vertically integrated organisation. Now we're seeing devices based upon technology convergence and integration.

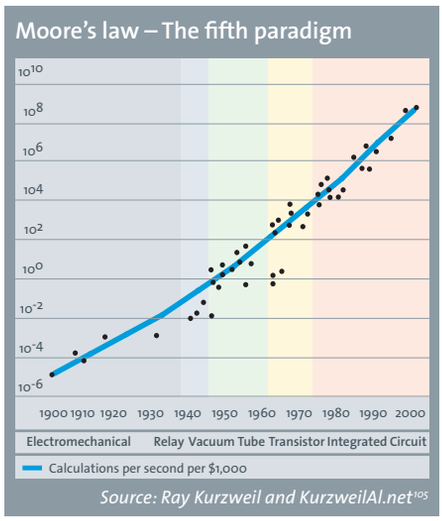
In order to participate in a market based on technology convergence, the industry has embraced what management consultant John Hagel III terms 'technology webs' or networks in which corporations and patent holders become interconnected through their technologies, products and intellectual property.[10, 11]

Technological monocultures

Complexity of knowledge and systems creates problems. Traditionally, technologies have been introduced in one place and over time they have been adopted elsewhere in an evolutionary manner – like gunpowder, steam engines or

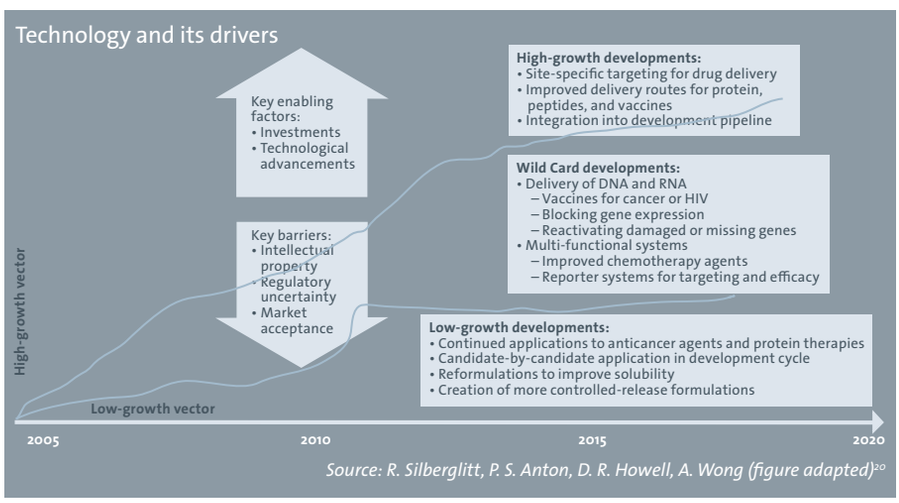
Right: Not only did Moore's Law predict advances in microchip sophistication, it also forecast falling costs. This is critical to the ubiquitous adoption of the technologies, further accelerating demand for innovation and creating a need for IPR around new developments with shorter cycle times and accelerated future returns.[18] Futurologist Ray Kurzweil has also placed Moore's Law into a longer-term context – he's plotted the speed (in instructions per second) per $1,000 of 49 famous calculators and computers as a function of time – to show how it's part of the general path of exponential increases in inventiveness in computation over the 20th century.[19]

Far right: The cover of *Time* magazine features a photo of the New York skyline sihouetted at sunset during the power outage on the Eastern United States accompanied by the headline, 'Blackout: Can it happen again?' New York, 25 August, 2003. Photo by Robert Giroux/Getty Images/Time Inc./Time Life Pictures/Getty Images



Right: Technology and its drivers. This chart on the range of possible future developments for nano-enabled drug delivery systems comes from the Rand report on "The Global Technology Revolution 2020, In-Depth Analyses" published in 2006.[20]

Note that technological possibilities only tell part of the story. Investment, market forces and, crucially, regulation and patent protection do have a major part to play in either accelerating and enabling the technology or causing development to stutter and slow.



cell-phones. This is no longer true. Now, the same technology is adopted in many places across the world at the same time.

Like plant monocultures, global technological monocultures are more vulnerable to systemic risks, potentially causing damage everywhere at once. Examples are the millennium bug and the *I Love You* virus.[12] As technological diffusion happens at ever shorter timescales, the time to fix any inherent problems gets shorter. Edward Tenner argues that technological diffusion will lead to 'revenge effects,'[13] the unforeseen consequences of technology that are not just a trade-off or drawback, but a tendency to cancel out the reason for the technology in the first place.

High-tech systems failures caused by patents

Global societies are increasingly reliant on these monocultures of technology – in health, communications, transport, energy supply, climate control, food and so on – and are therefore more vulnerable if they are disrupted. Human operator error or their inherently complex interactions can lead to breakdowns.

For example, the August 2003 blackout of a large part of north-east North America was initiated by a failure to cut back trees beneath a power line; but software bugs helped create a cascade effect cutting power to over 50 million people.[14] Technical problems, however, do not constitute the only cause for system failures. As we will see below, patent enforcement can create blockage in cumulative technologies. In the framework of technological monocultures, this in the end can cause the breakdown of entire high-tech webs. The BlackBerry case is a good example of this: BlackBerry is a mobile e-mail device with which e-mails can be sent and received. Specific aspects of the BlackBerry technology were allegedly infringing several patents. On the basis of this, the public in the US was expecting the shutdown of all BlackBerry services in 2006.[15] This could have let to the shut-down of 138 US Government agencies including the Central Intelligence Agency, the Army and the National Security Agency,[15] had not a settlement been reached at the last minute between the litigating parties.

Patenting software applications – a blessing or curse for innovation?

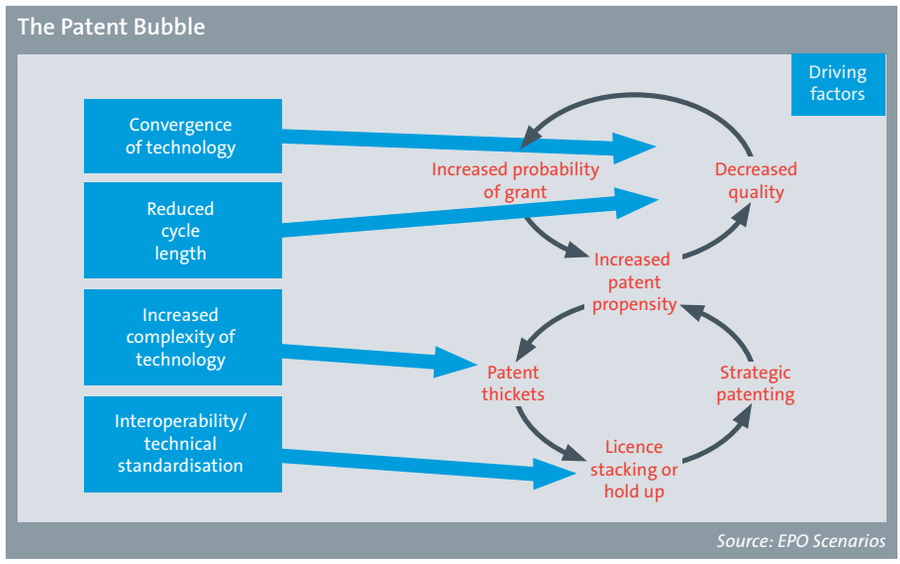
Specific technologies, particularly computer implemented inventions (CII), underpin many other fields, giving rise to terms such as 'ubiquitous computing.'[16] The term was coined by Mark Weiser from Xerox and refers to the imbedding of systems, allowing technology to recede into the background of our lives.[17]

According to Gabriele Mohsler, Director IPR of Ericsson Deutschland GmbH who was interviewed by the EPO for this project, "more than 90% of high-technology development is now software-related;" Joachim Henkel, Professor at the University of Munich, agrees. "The blueprint for each new product is basically software," he says. "The patent system needs to adjust to be flexible to meet the needs of technological changes," says Marshall Phelps, corporate vice president and deputy general counsel for IP at Microsoft. "For example, technology has changed whereby software is now interchangeable with hardware, but the patent system has not yet taken this on board."

As well as these technological developments and some significant legal changes, there has been a massive increase in the patenting of software. Corporations see huge opportunities for market control and profit by patenting various kinds of applications. Several reports have shown that strategic patenting in the software industry plays an increasingly important role in many companies' business models.[21, 22] At the other end of the scale, some developers are trying to make

Right: Patent thickets lead to hold-up situations, or in some cases to royalty stacking. That encourages companies to use patents as bargaining chips – if their innovation is being held up or they're being blackmailed for onerous royalty payments, they can counter-threat with potential infringement of their own patents. So they file as many as possible for each innovation to strengthen their hand – it's 'strategic patenting'.

It results in more patents per innovation ('patent propensity') creating even more dense thickets. Increased patent propensity is widely seen to be a major cause of the dramatic increase in applications worldwide. The latter is considered by many to lead to decreasing quality of issued patents. Decreased quality means there's higher probability of grant, creating an even bigger incentive for companies to file more patent applications, fuelling even greater patent propensity. The resulting self-reinforcing circles are further fed by convergence of technology, a reduced technological cycle length and the criticality of interoperability and technical standardisation to these new technologies.



Right: The man-machine interface.[46] According to the report of the NSF and US Department of Commerce,[35] "the synergistic effect of the three systems (the nanowworld, biology, information) will lead to an explosion of new knowledge and new capabilities." These increasingly complex and sophisticated systems will also start to apply aspects of cognitive science, pushing the boundaries of the man-machine interface and of artificial intelligence, further accelerating change. Source: http://snipurl.com/Cyber_girl

> **The increasing pace of scientific and technological developments as well as the new forms of convergence and interdisciplinarity will continue to create more debates touching on the justifications of the patent system. The challenges are both technical and ethical.**
>
> **Bert Gordijn**, Department of Ethics, Philosophy and Medicine, University of Nijmegen (EPO Interview)

patents redundant. Open source software (OSS) uses source code that is publicly available, enabling anyone to copy, modify and redistribute the code without paying royalties or fees.[23, 24]

"The open-source model need not necessarily be restricted to software," says Prof Henkel. Existing examples of this broader approach are the open source kite-building web site[25] or the OScar Project which aims to develop a new car designed collaboratively and without asserting componentised IPR.[26]

Why has open source been successful in the software arena? "Distributing patent rights involving many complementary programming tools among many different inventors (or first claimants) is a recipe for greatly encumbering software developers with the costs both in time and legal expenses of conducting patent searches and negotiating multiple licences," says Professor Paul David of Oxford and Stanford universities. As we will see later, one of the major reasons for the problems seen by many in the patenting of software applications is the fragmentation of patent rights in this sector.

Patent offices – are they lagging behind?

The increased complexity of technology has created a negative feedback loop within the patent system. This can result in an increase in patent propensity (the number of patents per innovation) in complex technological fields. Higher patent propensity is widely seen as a major cause for an increase in the numbers of filed patent applications and, in turn, the patent offices' growing backlog (the stock of unexamined patent applications). This is considered by many to create serious problems:

"In order to examine them properly, one needs staff with a high level of knowledge and expertise," says Shinjiro Ono, former Deputy Commissioner of the Japan Patent Office. "Even the large offices cannot recruit experienced examiners in sufficiently large numbers to cope with the speed and complexity of developments in emerging technologies, as well as the increased volume of applications."[27]

Industry representatives add that increased backlogs lead to pending times (time from filing a patent application up to grant) that exceed those of product cycles in high-tech areas.

Patent protection thereby may become obsolete: "What this may mean is that people might use the patent system less," Thierry Sueur and Jacques Combeau, from Air Liquide in France, told this project. "Mobile phone manufacturers produce new model ranges every 18 months, so what use is a granted patent? It is likely that industry will try to focus on other rights, and look for another system."

Technological interdisciplinarity – a challenge to patent offices

As technology starts to deal with problems on the nano-scale, distinctions between different types of technology get blurred; we can expect 'ubiquitous nanotechnology' in the near future, just as we have ubiquitous computing now.[34] According to a report of the National Science Foundation and US Department of Commerce,[35] the emergence of converging technologies over time can be described by two overlapping S-curves, one representing the computer and communications revolution in progress today and a second, just beginning, representing the NBIC revolution, i.e. the combination of nanotechnology, biotechnology, information technology and cognitive sciences.

"The biotechnology revolution is bringing the information revolution, with its exponentially increasing capacity and price performance, to the field of biology," says Ray Kurzweil in his book *The Singularity is Near: when Humans transcend Biology*. "Similarly, the nanotechnology revolution will bring the rapidly increasing mastery of information to materials and mechanical systems. The robotics revolution [means understanding] human intelligence in information terms and then combining the resulting insights with increasingly powerful computational platforms. Thus all three of the overlapping transformations that will dominate the first half of this century represent different facets of the information revolution."[36]

Increasing 'interdisciplinarity'[31, 32] – for example, the combination of nanotechnology, biotechnology, information technology (IT) and cognitive sciences (NBIC)[33] – is also increasing the challenges for the patent offices when it comes to expertise. Multidisciplinary technologies create a new challenge for the people charged with administering patents: how can you expertly assess a patent application for a concept that requires top-level understanding of not one, but perhaps four different disciplines?

Acceleration of technological change and interdisciplinarity are not the only challenges to the patent system, however – they're probably not even the most serious ones. It is the fact that the innovation process is increasingly cumulative and collective that leads to the much more fundamental question of whether patents promote innovation at all.

The patent mosaic – a brake on innovation

The cumulative innovation process and resultant complex products lead to a fragmentation of rights: the ownership on one product's entire know-how can be split between hundreds of different patent holders ('patent mosaic').[37] A single mobile phone, for example, might contain hundreds of patentable developments, from its screen to a particular camera component, a piece of music-playing software to a process for activating a particular function. Even the development tools used to come up with these small, individual innovations may contain several patents that need to be licensed by the users of the components.

In order to be able to commercialise such a complex product, hundreds of licences may be needed from different patent holders. As soon as one of them refuses to give such a licence, you have a hold-up situation in which the product cannot be commercialised – a 'blocking patent' has been used.[38]

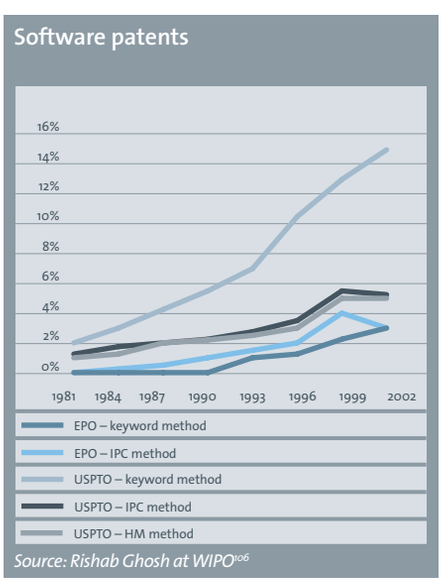
This combination of multiple patents around single objects or technologies is called a patent thicket and has severe consequences for innovation and commercialisation. One IT industry representative told a Federal Trade Commission team that more than 90,000 patents generally related to microprocessors are held by more than 10,000 parties. Many of these patents overlap, with each patent blocking several others. These kinds of problem with thickets have been the subject of much concern by IP regulators, economists and IP users.[39-45]

For example, a report prepared for the European Commission in 1999 argued that at some point

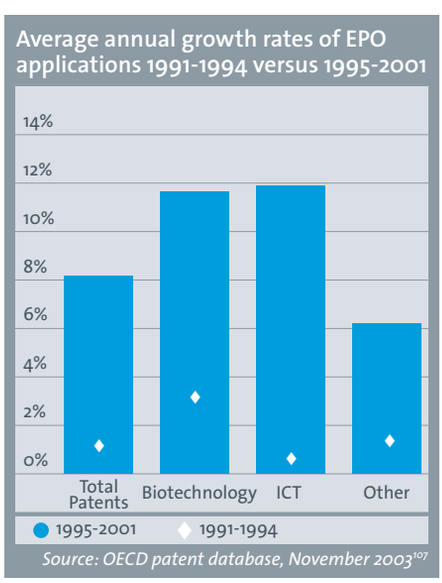
> **I consider the possibility of patenting software very important because the software industry is becoming increasingly important: as everything goes digital, things which used to be mechanical are being gradually replaced or complemented by software and electronics, so understanding the intellectual property situation for software is very important globally for the economy.**
>
> **Herve Gallaire**, President, Xerox Innovation Group and Chief Technology Officer (EPO Interview)

the fragmentation of IPRs among agents starts to impede progress, due to the failure of technology markets to deal with the problem of assembling necessary IPRs.[45] James Bessen, the director of Research on Innovation, pointed out in 2003 that shared ownership of technologies resulting from patent thickets is a disincentive to innovate.[41]

Thickets are not just hazardous to innovation of end products, either. In the field of genetic testing, for example, a patent on an isolated gene and all its fragments (the first stage of the development cycle) could be blocking all genetic testing for a disease.[47] A similar consideration applies to software: a questionable patent claimed on a single routine in part of a software program could be asserted to hold up production of the entire application. If scientists cannot further their work due to exclusive rights granted to one



Above: Software patents – the facts. Whichever data you look at, it's clear that there has been a significant increase in software patenting between 1981 and 2002.[21, 28] Despite this rapid growth, software's share as a proportion of all patents used in the US or Europe (as far as patentable under EPO practice) is still rather small: developers use mechanisms such as first-mover advantage, trademarks, technical protection, secrecy or copyright to protect their products, rather than patents.[29]



Above: Growth in patents for complex technologies. Although patent application growth was far higher across the board in the second half of the 1990s, the biotech and ICT industries showed a particularly big step-change in patenting activity.[30]

party, then the very process of cumulative scientific innovation could be stalled.[9]

Patents in cumulative innovation fields can thereby hamper society's ability to diffuse novel technologies. "The disadvantage of rigid patent protection is that it may slow the process of innovation, by preventing competing firms from building on each others' progress," said the report of the *Stern Review* into the economic aspects of climate change. "Within international debates on climate change there has been a particular focus on the role of IPR as a barrier to the international diffusion of technologies. From this point of view, patents on new products that could help developing countries to reduce their emissions make it more difficult to secure a global public good." In an OECD report on innovation in the business sector, econometric estimates suggest that stronger IP protection has a substantial positive effect on patenting but may have negative effects on technological diffusion in particular in the software sector.[30, 48]

Patent trolls – a cause for hold up?

Patent trolls try to profit by licensing or selling their (often simplistic) patented technology to a manufacturing firm that, by the time fees are claimed, has already infringed on the troll's patent (usually unknowingly) and is therefore under intense pressure to reach an agreement with the troll.[49]

In the US patent world, trolling takes at least two forms. Either one files a patent application for a good idea – with no intention to manufacture or exploit the idea – in the hope of catching out a company that uses the same idea later on; or one acquires existing patent portfolios with a view either to selling them later for a higher price or to using them as the basis for future legal proceedings.[50]

Trolling has got much more damaging as technological complexity and interoperability has increased because it's now easier to patent block. More specifically, in a complex technological world where patent rights on one technology are distributed between many different patent holders, trolls can block not only one but many economic players by one single patent at the same time. Technological complexity has also made it harder for companies to detect potentially infringed patents (in order to circumvent them), so there's an increased probability of accidental infringement.[49]

The sheer cost of legal proceedings in the US, the risk of treble damages for 'wilful infringement,' and the fact that parties bear their own costs there, has made the troll business a lucrative one[51] – innovators falling foul of trolls are more inclined simply to pay up the royalty.

And trolling has also got cheaper. The extension of patentable subject-matter to business methods in the US has made it possible to obtain a patent without much investment at all. Finally, innovators can't even use their own patents to issue counter-infringement claims against a troll in order to force an amicable arrangement – because trolls don't make anything. "If you are attacked by a patent troll company, you have nothing to bargain with," says Gabriele Mohsler, Director IPR of Ericsson Deutschland GmbH.

So there's a growing consensus that something needs to be done to minimise technology blocking.[63-65]

Interviews conducted by the EPO have thrown up a number of possible solutions. These include increasing patent quality to reduce the number of patents felt to have little or no inventive step (which are commonly used by patent trolls –

When IP goes nuclear

The BlackBerry case[15, 52-58]

The BlackBerry is a mobile e-mail device produced by RIM. In 2002, a jury in the US found it to be infringing several of rival company NTP's patents. In 2006, NTP asked a federal court for an injunction blocking the continued use of key technologies underpinning the BlackBerry. But the 4.3 million users of the device included many government agencies critical to the functioning of society.[15, 55] On 3 March 2006, NTP and RIM announced that they had agreed a settlement: RIM made a one-time payment to NTP of $612.5m and NTP granted RIM a licence to continue its BlackBerry business.

The e-Bay case

In 1995, MercExchange filed a patent application, later granted by the USPTO, referring to a 'direct-buy' system, similar to eBay's well-known 'Buy It Now' feature. In June 2000, eBay began talks to license the patent, but they broke down. In September 2001, MercExchange filed suit against eBay, and sought an injunction in the US Supreme Court.[59] A May 2006 decision overturned the lower court ruling that an injunction should be issued against eBay due to its infringement.[60] "So profound is the impact of a patent injunction against the practice of a broadly-adopted standard that the mere possibility of patent coverage has led to the abandonment of some standards development efforts," said IBM in a submission related to the eBay case.[61]

The anti-spam case

A working group known as MARID started to develop a 'Sender ID' system to prevent 'spam.' Microsoft had applied for a patent on the method for polling a database, and although the company promised to make the technology available for free, it wanted to bar software developers from further licensing it. The MARID project was abandoned.[62]

Trolling for profit

"The expense of defending a patent action may force innocents to pay royalties when legitimately they should not pay. The money-makers are using the patent system for pure profit, and have no true connection with any inventive activity."

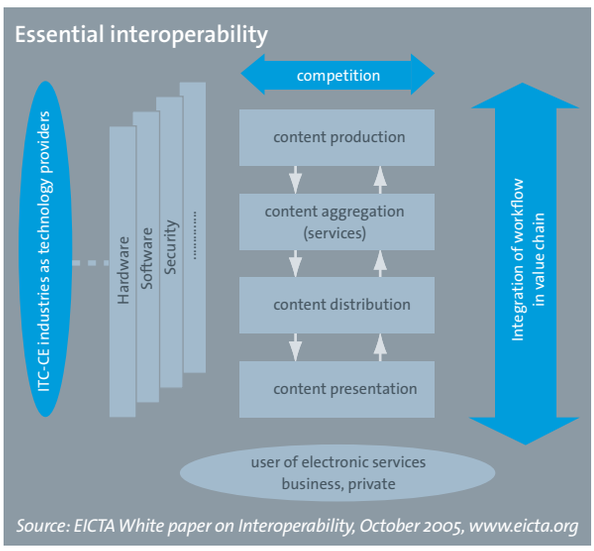
Hugh Brett, Editor, European Intellectual Property Review (EPO Interview)

"Having non-standardised technology is not acceptable for consumers. As it reduces consumption, it's also to the disadvantage of industry. Only if there is a single standard for certain products can resource and energy consumption be optimised. They will play an increasingly important role in the future.

Axel Zweck, Future Technologies Division of VDI TZ GFmbH (EPO Interview)

Right: Complexity creates blockages. In order to transform an idea into a commercialised product, multiple sets of licences might be needed. One might have to get licences for research tools at the very outset of the project, various parts of the product into which the innovation will be incorporated, and further products and components with which the product has to interoperate as part of a technology web. As soon as one of the potential licensors refuses to give a licence, commercialisation is made impossible.

Below: Essential interoperability The multimedia value chain demonstrates the importance of interoperability. Any system needs to be able to handle different kinds of content (music, films, data and so on), kinds of services (streamed files or subscriptions) and devices (different types of computer, TVs, DVDs, etc).[23] Existing value chains have been rearranged and merged with formerly separated neighbouring chains to create a complex web of interoperability, knitting together different (IP-protected) technologies for the benefit of the end user.



Source: EICTA White paper on Interoperability, October 2005, www.eicta.org

Interoperability is a challenge for the current IP system. Granting patents with too low an inventive step may block not only the copying of the invention as such, but any program that interacts with the newly invented software.

Joachim Henkel, Professor at the Schöller Chair in Technology and innovation management of the Technical University, Munich (EPO Interview)

some see this as a reason why trolling is not as prominent in Europe as it is in the US); weakening the injunction power conferred to patent holders (meaning trolls couldn't halt innovation and/or production); amending patent law to allow holders to ask for licence fees or an injunction only where they are active in the field; and working out hypothetical invent-around costs as a benchmark for the size of damage awards in court cases.[49]

Despite all the negative effects of trolling and the desire to reduce its impact, it is clear that, for the moment, trolls have become an integral part of the patent system. Countermeasures against trolling are not easy and may, if not properly evaluated, even harm the innovation process. Private inventors who may not have the means to commercialise their inventions, for example, are technically trolls even though they seek to innovate.

Technological interoperability – a critical success factor

The information technology and other high-tech industries rely on interoperability for their success. Peripheral products need to work with many different manufacturers' computers, for example. They have to share interfaces, protocols and languages, forming a technology web.[66] A European Information & Communications Technology Industry Association (EICTA) white paper in 2004 made it clear that the value of these networks to the participants, and the public, is huge: "Interoperability is the main counterforce to fragmentation, which potentially destroys the 'network effects' opportunity in the new converging services to boost European competitiveness, productivity, growth of GNP and high employment."[23]

Jean-Francois Abramatic, vice president for R&D at software developer Ilog Inc. and former chairman of World Wide Web Consortium (W3C) stated in 2004 that "interoperability of any kind of software is a feature which benefits the whole community at large so any action from legislators to encourage interoperability is welcome."[67]

The problem is that to build in interoperability, almost by definition, you have to borrow someone else's idea.[68] "It is absolutely necessary to provide for legal certainty that this will not be considered to be a patent infringement," said the European Consumers' Organisation in 2005. "Neither Articles 81 and 82 of the Treaty nor the threat of compulsory licensing will be enough to persuade a patent holder to ensure timely interoperability, in particular in the light of the short life span of software products."[69]

One solution to this problem is that certain limitations to the exclusive right of the patent owner could be introduced,[66] as we'll see later. But there remains the issue of how technical standards are agreed.

Standards: life-blood of technology

The importance of technical standards cannot be overemphasised.[70] For example, GSM and UMTS allow us real choice in mobile telephony; MPEG, GIF and JPEG mean we can share digitised sounds, pictures and movies; DVD is a standard, as is hypertext transfer protocol (HTTP), the universal language for web pages.

Third generation (3G) mobile phone technology is covered by the standard W-CDMA and it's a perfect example of the problem with patents in standards. This technology is protected by more than 2,000 patent families comprising more than 6,000 individual patents from some 50 companies and consortia.[71] As discussed earlier, this fragmentation of rights leads to the danger of hold-up situations,[40] which in technical standards can be created by participants in the standard-setting process as well as external parties (the 'outsider problem').[72]

"In high-tech industry, research collides with collective standards," claimed German publication GRUR in 2002. "While technical standardisation is meant to transform ideas into a public good, patent protection transforms them to private property."[73]

And the Director of Intellectual Property Rights, Regulatory Affairs at Nokia in UK, Tim Frain, noted in 2006 that "absent a dominant position [where competition law might prevent blockage],

there is no mechanism in the current legal regime to adequately address the situation where a patent owner may be using a patent to block a technical standard, for example by charging excessive royalties."[66]

There's a further problem with patent blocking in technical standards. Because, by definition, they are widely shared, it's rarely possible to 'invent around' such blockages. Once specifications of a standard are set, the substitution of one infringing technology with an easy-to-invent alternative entails the adjustment of such a large number of product components that the work-around becomes extremely costly to implement.[49,74]

The situation is therefore serious, and real. Current examples include MPEG-4 where AT&T has attempted to enforce several patents related to video compression;[75,76] and the standardisation of the syslog protocol by the Internet Engineering Task Force (although Chinese corporation Huawei Technologies had been offering generous licence terms, many feared it remained ready to block the standard).[77]

Patent pools – a solution?

A patent pool is an agreement between two or more patent owners to license one or more of their patents to one another, or to license them as a package to third parties,[38] creating useable bundles that overcome the 'tragedy of the anti-commons' while preserving the incentives to innovate.[78]

Patent pools already have a history of helping technological and product development when rights are splintered. And according to a report prepared by the USPTO[79] in 2000, they also reduce licence transaction costs, distribute risks among the members of the pool and foster better exchange of information. Professor Carl Shapiro of the University of California at Berkeley[40] and Professor Robert Merges, the Director, Berkeley Center for Law & Technology[78] have both highlighted the importance of patent pools in handling patent thicket situations. However, Professor James Bessen[41] takes a similarly critical view. In 2003 he said that "these institutions do not correct all problems associated with patent thickets." And there's nothing to stop the 'outsider problem' from striking pools, either – members of a pool, if they see a more lucrative route, can simply step out and block the collective endeavour.

The holy cow: one size fits all

These problems are all serious. But they do not apply equally to all technologies. On the contrary, while information and communication technology industries suffer quite badly, the pharmaceutical sector is relatively happy with the current system. So is a (largely) 'one size fits all' patent system that applies broadly the same approach for all technologies workable, given this new speed, multidisciplinarity and complexity of technology? Should we consider a split – 'bifurcation' – of the system? There are no easy answers. What is clear is the considerable tension that the needs of different industry sectors has created on the patent system.

"A fairly new and significant development in the last ten years is the emergence of a split between the interests of the newer high-tech industries and the more traditional industries, such as the pharmaceutical industry, with regard to influencing IP policy," says Stephen Merrill, Executive Director of the National Academies' Board on Science, Technology, and Economic Policy. "These two disparate groups see their interests quite differently and are divided regarding the function, value and policies that should govern the patent system."[84] Worse still for the patent regulators, the number of applications is growing far faster for the hard-to-handle complex technologies. "IT (information technology) experiences these policies differently because it is marketed in the form of complex products that can incorporate many thousands

Above: Standards in the IPR firing line – There are many examples of patent disputes disrupting technology standards-setting – and of patent holders using their IPR as leverage for commercial gain. For instance, UMTS (the universal mobile telecommunications system for 3G phones) – a standard established by the European Telecommunications Standards Institute (ETSI) and Ericsson – was thrown into question when Qualcomm came up with numerous patents that were allegedly infringed by the proposed standard[80] and sought an alternative more compatible with its own technologies. Or the the SDRAM (synchronous dynamic random access memory) standardisation work, which was started in 1992 by JEDEC. Rambus, a member of the organisation, withdrew from the body and amended claims of its patent applications then pending such that they then covered the SDRAM technology. These applications were granted in 1999 and 2000 – when Rambus started infringement proceeding against three SDRAM manufacturers.[73]

Patent pool precedents

1917: an aircraft patent pool was privately formed to cover almost all aircraft manufacturers in the US.[81] This was crucial to the US government because the two major patent holders, the Wright Company and the Curtiss Company, had effectively blocked the building of any new airplanes which were desperately needed for the First World War.

1924: the Associated Radio Manufacturers (later the Radio Corporation of America), merged the radio interests of American Marconi, General Electric, AT&T and Westinghouse, leading to the establishment of standardisation of radio parts frequency locations and television transmission standards.[81]

1997: the Trustees of Columbia University, Fujitsu, General Instrument Corp., Lucent Technologies, Matsushita, Mitsubishi, Philips, Scientific-Atlanta and Sony formed a patent pool to share royalties from patents that are essential to compliance with the MPEG-2 compression technology standard.[82]

1998: Sony, Philips and Pioneer formed a patent pool for inventions that are essential to comply with certain DVD-Video and DVD-ROM standard specifications.[83]

of patentable functions," said Brian Kahin, Senior Fellow at the Computer & Communications Industry Association, in 2006. "Assertions of patent infringement are epidemic in IT, because of the likelihood that complex products will inadvertently infringe on third-party patents. The one-size-fits-all paradigm of patent law is broken."[85] It's a sentiment with which even the US Federal Trade Commission agrees.[86]

How could bifurcation work?

The existing patent system confers absolute ownership rights over patented innovations. If the patent holder chooses, he can simply deny any other party the right to use his idea for as long as the patent stands. That simple fact is what creates problems with thickets, gives trolls their leverage and encourages blockage of technical standards in certain technical areas.

But if, instead of that absolute barrier, the system allowed for controlled access to patented inventions – while still guaranteeing the patent holder remuneration for their inventiveness and thereby maintaining the incentive for innovation – the outright blackmail of trolling would be removed. In effect, you turn patents in these areas from road-blocks into toll booths. This might work in a number of ways. "One option would be to introduce a statutory exemption that permits the granting of a compulsory licence which allows the usage of IP-protected standards if such usage is necessary to achieve interoperability with a technology that has evolved into a de facto standard," argues Kamiel J Koelman. Taking this one stage further, a compulsory licensing framework could ensure that licences to use standards-related patents for interoperability purposes would be available as a matter of right to third parties ('licences of rights').[66, 87] This type of proposal is also endorsed by Prof Reto Hilty of the Max Planck Institute for Intellectual Property, Competition and Tax Law, Munich, who has suggested a licence of rights regime in the software sector.[88]

Some experts go even further and advocate a more general application of licence of rights to all complex technologies, implying that patent owners no longer have the right to exclude others but only to remuneration: "Of all types of industry and business which use intellectual property, the proposed change (to a licence of rights regime) would be most beneficial in complex technologies, which are rapidly increasing in importance," says Prof William Kingston from the School of Business Studies at Trinity College in Dublin.[7] A more general application of a licence of rights regime in cumulative innovation fields is also advocated by Professor J H Reichman. According to him, in such a regime, the success of multiple players in the relevant technical universe should correspondingly augment the flow of investment and technical information to that universe as a whole, as players participate in the industry-wide virtual partnership that a liability rule supports.[89] Better yet, argue some commentators, the compulsory licensing mechanism could also be applied in public healthcare and genetics arenas to settle access problems between multiple patent holders and multiple technology users.[38]

Common to all licence of rights proposals is the fact that court injunctions that stop any alleged infringer from using a patented invention are no longer available. In other words, under such a regime any patentee would be forced to give a licence to anyone for his patented invention. Some industry representatives, though being in principle in favour of a licence of rights regime, would prefer a licence of right regime where patent owners have the possibility to introduce defensive termination clauses into the licence contract that allow the patent owner to withdraw the licence in specific cases, e.g. where they are sued for patent infringement by the licensee.

All these approaches share the idea that the rights patents confer to their owners are restricted in some or all complex technological areas to ensure that hold-up situations are avoided: strong patent protection would remain in areas such as pharmaceuticals, but weaker rights in areas such as the information and communication

Additional incentives have been introduced to encourage research by reducing the risk of R&D (with e.g. tax credits) or increase drug profitability with tax break or extended monopolies. See page 76

> **It seems ludicrous that a patent system offers 20 years' protection in all areas of technology, when investment in biotech technology is so much greater than in mechanical technology. A patent is a clumsy instrument and more flexible incentives could be provided, such as tax incentives on investment.**
>
> **Michael Blakeney**, Herchel Smith Professor of Intellectual Property Law and Director of Queen Mary Intellectual PropertyResearch Institute, London (EPO Interview)

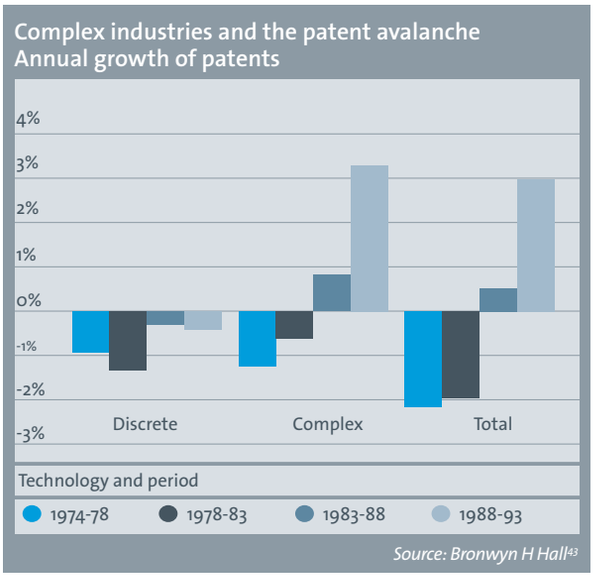
How technology is demanding variety from patenting

	Pharma	Biotech	Computer Hardware and Semiconductors	Software and Internet
Innovation type	mainly discrete	discrete and cumulative	cumulative	cumulative
Product complexity*	few	medium, high for research tools	high	high
Importance of interoperability	negligible	negligible	high	high
Blockage potential of patents	negligible	negligible, except for research tools	high	high
Innovation costs	very high	very high	medium	low
Product cycle	long	short – long	short	short
Patent use	protective (return on investment)	protective (return on investment) + attract capital	defensive (freedom to operate)	defensive (freedom to operate)
Major alternative IP approaches	none	none	trade secrets	copyright and open source
Relevance to systemic failure	low	medium	high	high

Source: EPO Scenarios ** Product complexity defined as number of patents per product*

Above: The pharma and biotechnology sector as representative of mainly discrete industries is compared to the hardware, software and semiconductor industry as representative of complex technologies.

> **"There are some clear differences in industry attitudes to exclusive rights. The pharmaceutical industry needs very strong protection because of the high investment required to develop medicines. In the pharmaceutical field one or two patents can completely protect an idea; i.e. a company has a total monopoly and there is no licensing. However, in the case of the information technology and electrical industries, one new product is usually protected by more than 100 or 1,000 patents. Because so many elements are gathered in one product, these industries have a different attitude to the need for a monopoly – cross-licensing is essential and no one company can protect its innovation on its own."**
>
> **Shinjiro Ono**, Former Deputy Commissioner, Japan Patent Office (EPO Interview)



Left: In discrete industries, the number of patents being filed actually fell in the two decades after 1974.[43] Contrary to this, a massive increase in patent application numbers and the emergence of thickets in complex industries such as semiconductors and software was observed.

> **We will still have intellectual property, but I think it will be limited to certain forms of technology. In terms of legal responses or alternatives, a strict liability rule is very feasible. This will allow use of innovation without permission, but create a liability for paying a negotiated price.**
>
> **Professor Ruth Okediji** of Harvard University (EPO Interview)

technology sector. First signs of a weakening of patent rights can be seen already today. In May 2006, the Supreme Court of the United States issued a decision in the eBay case[59] which held that the order of an injunction against an infringing party cannot be effected automatically upon establishment of the infringement. Before that happens, the court must check whether specific criteria are fulfilled.[90]

Although the cases where an injunction can be ordered remain open for interpretation by that decision, it clearly weakened the exclusion right conferred by patents. And that makes it the first pointer in the direction of a mandatory – injunction-free – licence of right regime.
A further pointer into this direction is the possibility for patent holders in several legislations to offer a licence of right with the proprietor being compensated appropriately. In an exemplary manner, reference can be made to the legal situation in the UK and the proposal for a council regulation on the European community patent.[91]
A further early trend into this direction is the licence of right regime foreseen in Article 9a of the draft Swiss Patent Convention that provides for a licence of right with regard to all patents directed to research tools.[92]

In other words, the unstoppable and compelling momentum of technological advancement is already changing how the patent system works.

Adapting to change – patent offices cannot escape

And that means the patent offices must be open to change, too. Adaptability could be achieved by more responsive governance, characterised in part by greater public participation. This would allow the incorporation of society's views directly into the service delivery process.[93] This could be analagous to the e-rulemaking process in the US which allows citizens to influence the drafting of regulations. Other examples of this interactive approach include the USPTO peer review project,[94-97] Wikipatent,[98] the Patent Bust site[99] and BountyQuest[100] which all allow for some form of public engagement in the patent granting or validation process.

Greater citizen participation is enabled by advances in information and communication technologies which could lead to changes both within institutions and at the public/private interface. Internally, this would mean that processes and relationships could enable greater levels of interdisciplinarity and collaboration within and across institutions, thereby forming a networked 'virtual organisation.' Relations with users and interested parties could be transformed via various forms of digital democracy, including 'virtual communities'.[93]

Huge changes are now also taking place in knowledge search. These include use of metadata by tagging certain parts of documents to make them more searchable;[101] creating access to distributed data with full integration of different data types; and systems to replace the simple tagging of data with ontologies that are networks of objects, their properties and their relations to one another[102] (which are currently under development). These changes could be applied across the entire world wide web, leading to the 'semantic web' (also referred to as Web 3.0), the underlying technologies of which are rapidly gaining adherents at big companies like IBM and Google, as well as small ones.[103]

"All of those involved in scientific publishing are in a period of intense experimentation, the outcome of which is difficult to predict," claimed an article in *Nature* as early as 2001. "Getting there will require novel forms of collaboration between publishers, databases, digital libraries and other stakeholders."[101] And in 2006, *The New York Times* added a commercial dimension: "How such systems will be built, and how soon they will begin providing meaningful answers, is now a matter of vigorous debate both among academic researchers and commercial technologists. But all agree that if such systems emerge, they will instantly become more commercially valuable than today's search engines."[103]

Who conducts technological knowledge searches and how they do it are likely to be major questions for the future. Commercial interests are likely to play an important role, and a key question in this context will be whether patent offices (or, more generally, the public sector) will still be major players in the area of patent information in 2025 or whether this will be entirely in the hands of private companies. If the private sector takes over, the over-riding question then becomes: how will neutrality, secrecy, security and quality be safeguarded?

All the challenges that technological change puts on the patent system and institutions can be summed up nicely by a statement made by Thierry Stoll, Deputy DG for the Internal Market and Services, European Commission and Jacqueline Minor, Director in charge of Knowledge-based Economy, European Commission when interviewed by the EPO:

"The evolution of technology is the factor that has been instrumental in shaping the way patents are perceived and managed. Patents did not emerge in the last couple of decades, they have been around for centuries, but society is now confronted with some of the consequences of technological evolution… Technology is shaping the debate, and is a key factor in changing the perception of intellectual property" ■

Right: Comparing IP systems Licence of rights has several advantages over the traditional patent regime in protecting technological innovation while at the same time allowing natural development of technology.

- No hold-up – the system quickly resolves disagreements, removes the power of injunction and takes away the incentive to block.
- Ability to commercialise – products come more quickly to market and with less administration of potential patent blockages.
- Diffusion of technology – innovations involving many different technologies are easier to develop once the inventor knows there won't be blockages.
- Some return on IP investment guaranteed – which maintains the incentive to innovate.

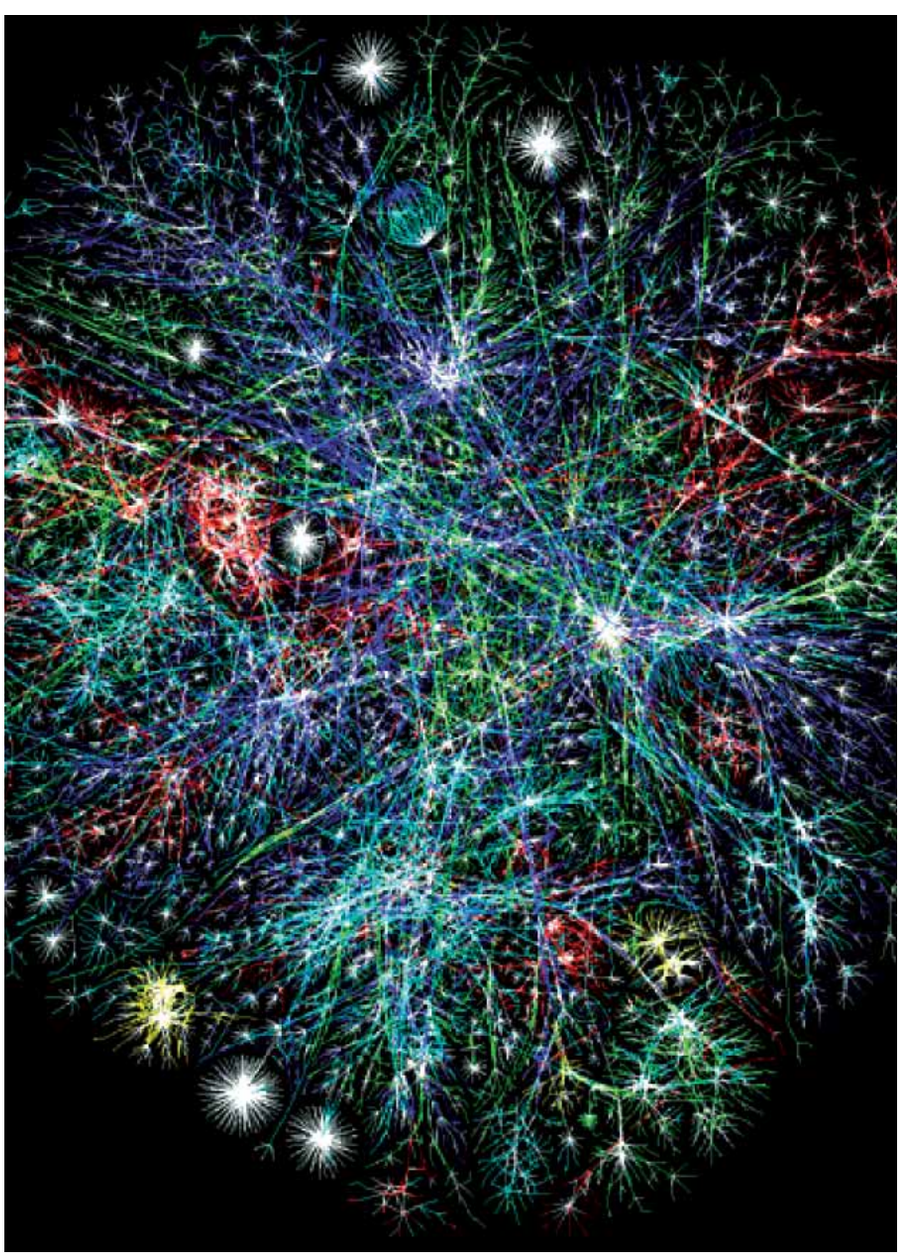
In legal terms (see table), it acts as a hybrid between the increasingly popular open source model and the traditional IP regime.

Putting licence of rights in perspective

	Open Source	Licence of rights	Patents
Legal basis	Copyright	Patents	Patents
Exclusivity	No	No	Yes
License terms	Acknowledge author Make improvements publicly available.	Remuneration	Remuneration (if applicable)

Source: EPO Scenarios

> **We have to adapt the patent system to the progress of science and technology, and at the same time we have to utilise the advances made in these areas in our patent system. The framework and regime of the system will have to respond to scientific progress and technological changes.**
>
> **Hiroshi Ogawa**, Ex-Comissioner, Japan Patent Office (EPO Interview)



Right: Visual representation of the internet, 2003 (Asia Pacifica – Red, Europe/Middle East/Central Asia/Africa – Green, North America – Blue, Latin America and Caribbean – Yellow, Unknown – White).[104] Source: www.opte.org/maps

BLUE SKIES SCENARIO: THE JOURNEY TO 2025

The 2007 report from the Intergovernmental Panel on Climate Change left little room for doubt. Concentrations of greenhouse gases had risen markedly since 1750 and now 'far exceeded' anything found in the ice core record going back thousands of years. The day the report was issued, debate focused on how quickly the climate might change, how bad the damage would be, and the cost of reducing emissions.

In the parallel world of IP, however, climate change was largely irrelevant. Issues of piracy, harmonisation and workloads dominated debate. IP itself, was untouchable. Most simply assumed that technology would save the world – as it had done before – and sound patents would encourage the best technological solutions. End of story.

In fact, nothing was so simple anymore. Global finance, global communications, global transport, global systems of all kinds, had already increased society's complexity beyond any human ability to imagine it. It was also harder and harder to separate human societies from the complex climate and ecosystems in which they survived. Even that glory of civilisation – technology itself – was excessively complex, as was the patent system behind it. A single mobile phone could be covered by 500 patents while more elaborate technologies required even more. As awareness of complexity grew, so too did fear of mankind's dependence on complex systems.

With this fear, complexity became paralysis. Small agreements to reduce greenhouse gases were elusive as interested players feared small changes could tip into large losses without warning.

The system was too big. What could anyone do?

Behind the scenes, things were different. As democratic governments bowed to the pressure of voters and large financial supporters, technocratic civil servants studied the implications of climate change. In Japan, during 2007 and 2008, this debate quietly crossed the ministerial boundaries between industry, foreign affairs and environment. Working together, a small group of senior civil servants highlighted five serious issues facing Japan. First, as the population aged, economic growth could only come from exports; second, there was high demand worldwide for low-emissions technology; third, the new low-carbon markets in Europe would only increase that demand; fourth, competing Asian economies had captured consumer electronics, but were still indifferent to the potential of environmental markets; fifth, by stimulating low-carbon technologies, Japan's dependence on oil would fall. The technocrats also felt that Japan needed a new goal to replace the mindless consumerism of recent years. The ambition to develop the best greenhouse technologies and dominate new environmental markets was both admirable and clear.

The more the technocrats discussed it, the more their 'Blue Skies' policy made sense. When doubters questioned it, they were shown the latest figures on the sale of hybrid cars and went silent. Not only was the need to reduce greenhouse gases a necessity, it was also an outstanding business opportunity.

Having agreed amongst themselves, the technocrats needed to persuade the politicians. To the conservative prime minister, they proposed a return to the nationalistic tools of post-war policy: protected long-term finance through the keiretsu business groups, competitive government-commissioned investments in environmental technologies, and a return to the loosest possible protection of intellectual property. Business would no longer be hostage to IP constraints and could grow through rapid technological developments to clean energy and reduce greenhouse gases. Patent trolling, patent thickets and royalty stacking would become the exception not the rule. Instead, technology diffusion and international marketing would again set the pace.

Some foreign firms withdrew from Japan, while the modernisers in government criticised the return to inefficient structures of the past. These voices went silent in 2010 when a major typhoon swept up Tokyo Bay, creating the kind of chaos seen in New Orleans five years earlier. What had once seemed a fanciful indulgence, was now accepted as a vital necessity.

Soon after the Tokyo Typhoon, the EU Commission circulated a proposal to imitate the Japanese experiment with 'soft IP' rules for Blue Skies technologies. It had been given a dusty reception and shelved, but evidence of rapid climate change kept growing. Sea levels were rising at an exceptional pace, and the Gulf Stream was weakening. There was also huge disappointment over the results of the first Kyoto Protocol period, which ended in 2012. Despite the commitments of the signatories, greenhouse gas emissions had continued to rise. In some desperation, new agreements were put in place. Major hopes were placed on the growing sophistication of the emissions trading markets, which drew in new members from India, Brazil, South Africa and several American states.

By 2013, 'soft IP' was accepted in Europe for several complex energy technologies only. There were numerous disputes over what was – or was not – covered by the directive, but firms began to expand their own Blue Skies inventions to meet the demands created by stronger carbon markets.

A similar approach was taken in the US. Several dramatic natural disasters led to the withdrawal of storm insurance cover from over-populated coastal areas. Angry voters voted in the 'Climate Congress' of 2012 as well as a president determined to tackle environmental issues. In the spirit of the Moon Launch, he called for Congress to back the development of a hydrogen-based transport system by 2022. It was the new Manhattan project. If anyone could make it happen, he said, Americans could.

US optimism was encouraged by breakthrough research into ways of producing hydrogen with clean renewable energy sources, but there was still a long way to go. Surprisingly, money was not the most important issue, it was patents. Fuel-cell innovation was drowning in a global patent thicket. By 2015, it was covered by 18,000 patents owned by hundreds of patent holders. Finding willing licensors, negotiating and paying the required licence fees led to crippling transaction costs. Most serious was the ability of one or more individual patent holders to hold the entire fuel-cell development regime to ransom. Patent trolls, attracted by the

huge governmental investments, made things worse: interoperability in fuel-cell technology was almost entirely lost by the trolls increasingly enforcing their patents. Competing companies spent vast sums to avoid this kind of interoperability problem in hopes of dominating the market alone. In fact, the task was too big and required numerous compatible inventions.

The 2014 Hydrogen Economy Summit (HES) declared that the 2022 goal was unachievable unless technological diffusion and shared innovation was encouraged. As an emergency response, Congress passed a bill establishing an obligatory 'licence of rights' on any patent affecting the hydrogen transport economy. Patent holders were no longer able to block the technology – they were obliged to license it to any user under specific conditions and fees.

With this new law, hydrogen R&D accelerated, just as Blue Skies technology had done in Japan. By 2020, the new technologies were being applied around the world to energy conservation, clean fossil fuels and renewable energy production. Many of the technologies flourished as demand grew on the back of the expanding emission trading markets. Their success was undeniable. Although China and India kept growing, the increase of greenhouse gases had finally begun to slow down.

The success of soft IP systems in Europe, Japan and the US, prompted other industries to push for an extension of similar rules to cover their complex technology areas. There were especially numerous demands for soft IP in any technology with the promise of reducing environmental damage. Clean water technologies quickly joined the Blue Skies technologies of clean air. The old IP system did not die away, however. Pharmaceutical companies, and other businesses developing less complex, discrete technologies, sought to keep it in place, especially where they had invested heavily in research. IP institutions were feeling the strain, however, as they repeatedly had to decide what was and what was not covered by the different regimes.

Inevitably, different players tried to steer things to their own advantage, often relying on a new international IP court to resolve hard issues. The complexity of human and natural systems had their own logic, however. Climate change continued to accelerate in unpredictable ways and places, thanks to the legacy of gases in the atmosphere. Human systems were equally unreliable. In 2023, the internet broke down thanks to an IP dispute. In an attempt to circumvent a patent, several system administrators had rolled out a half-tested operating system which developed unexpected interoperability problems. Without warning, all traffic stopped at 11pm on July 28. Government ground to a halt. Commerce – which had moved out of shops and into warehouses and delivery vans – collapsed. Schools had almost no teaching materials; the just-in-time supply systems used by hospitals meant basic medical treatment couldn't be administered. For a week, there was total chaos.

The crisis forced people back to simpler communications and work patterns. Many found it refreshing. Perhaps complexity was not progress. Perhaps there were simpler ways of doing things, after all.

The IP world in 2025

Patent offices today are able to adapt quickly to technological change. This agility mirrors changes in the way the offices work, in particular in the examination of patent applications. This is now supported by ICT tools, allowing information and ideas to be shared between IP institutions and also with the outside world, for instance with technical experts and information providers. These changes allow the patent offices to issue legally strong patents more quickly. The problems of backlog and the resulting legal uncertainty are reduced considerably.

Patent information services have also improved and now offer extensive information based on improved search tools allowing 'intelligent' technical searches that embrace functionalities of the new Web 3.0, and patent-mapping. Information on patent licensing and searches allowing technical standards to be set up without infringing existing patent rights are now offered routinely. Commercial companies also play an important role in providing these services.

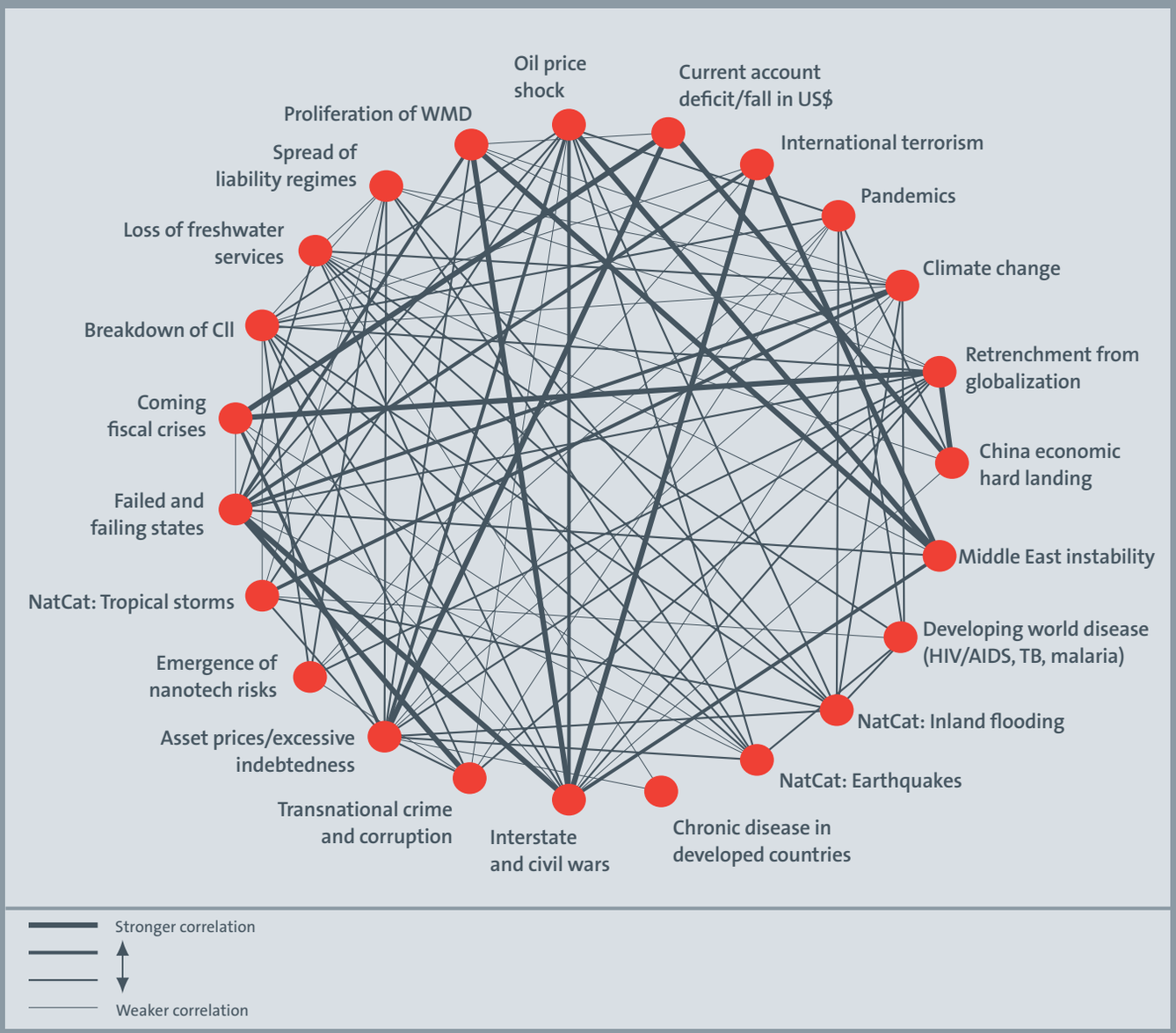
Computer translations are available from and into almost any language. Translation costs have dropped to a negligible level. At the same time prior art is now accessible to any expert irrespective of his/her nationality due to the availability of computer translations. Language is no longer a barrier and translations no longer account for a significant proportion of the costs of obtaining a patent.

The kind of IP available has also evolved. There are now two distinct kinds of patent: a soft patent for complex technical fields, such as the ICT, and classic patent rights for areas such as the pharmaceutical sector. 'Soft patents' no longer offer completely exclusive rights and this means that innovation is no longer held up by blocking rights. The 'soft patents' foster collaborative innovation, e.g. open innovation networks and patent-pooling. Unfortunately, deciding which technology falls under which legal system has created a new arena for legal battles. Disputed cases are dealt with by supranational bodies.

Due to the shortening of technological product cycles and the removal of exclusivity of patent rights in complex technological fields, alternative types of protection, such as branding, secrecy and technically implemented copy protection (DRM), have become more important. Secrecy, however, is increasingly difficult to handle by companies due to high mobility of the workforce. Furthermore, a number of laws have been passed which restrict the right to secrecy of commercialised goods.

Secrecy and branding are not the only alternatives to patent protection. In particular, in emerging technologies and complex technical fields, open source has increased in importance and is broadly accepted as being able to deliver high-quality products. So for complex technologies the soft patent regime and the open source approach co-exist and both support a collaborative innovation process. Even for those areas where classic patents are still available, open source has, to a certain extent, become part of the system.

The Correlation Matrix



Source: World Economic Forum, Global Risks 2007, A Global Risk Network Report, January 2007[108]

KEY QUESTIONS

- **How can technical expertise be identified and measured? By whom?**
- **How can valuable knowledge be protected in emerging and complex technological fields?**
- **Should the current one-size-fits-all patent system be abolished to meet the needs of differing technological sectors, where will the boundaries be drawn? By whom?**

SCENARIO ANALYSIS

We believe that the set of four scenarios we've put together here covers many of the issues facing the world of patenting and intellectual property today. Each scenario has a different character, each one is a wind tunnel in which we can test our assumptions about the future. Together they aim to uncover resonances with the key issues facing the system as a whole.

This project has taken us across the globe with the aim of involving as many stakeholders as possible in the debate. Their contributions are the building blocks of the four worlds we have built. What is clear also from their reflections (and browsing the interviews we have conducted in the accompanying CD-ROM will certainly reward the interested reader) is that despite extensive criticism, the basic concept of patenting is generally accepted as positive. But the question remains of how we can achieve a balance between multiple conflicting requirements – those of private and public interests, developing and developed countries, small inventors and global multinationals, traditional technological fields and emerging technologies, to name but a few.

As Walter Holzer, patent attorney and former President of the *epi* says: "The patent world is a hermetic world of a few tens of thousands of people… For the world of believers, no better system has been developed to protect technology." Even today the system remains relatively insulated from the outside world, but the 'hermetic seal' has been stretched to – and often beyond – its limits in several places.

Our analysis indicates that this vital system is one facing profound systemic change. This transition has happened so quickly that it has been hard for those within the hermetic world to grasp this and adapt to these changing conditions. The expanding stresses and strains within the patent system, caused in no small part by the need to cope with the growing demands of an ever-increasing number of global players, have created blockages, growing uncertainty for business and societal questioning. These tensions are being exacerbated by the driving forces pressuring on the system.

This is a world where conflict and the need for change co-exist; how these changes impact the system, moving it in the direction of one of these four scenarios, will depend on how the driving forces we have identified interact and play out.

The four scenarios

Market Rules *a world where business is the dominant driver.*
It's a story of the consolidation of a system so successful that it is collapsing under its own weight. New forms of subject matter – inevitably including further types of services – become patentable and more players enter the system. The balance of power is held by multinational corporations with the resources to build powerful patent portfolios, enforce their rights in an increasingly litigious world and drive the patent agenda. A key goal is to increase shareholder value and patents are widely used as a financial tool to achieve that end. In the face of ever-increasing volumes of patent applications, various forms of rationalisation of the system occur and it moves to mutual recognition of harmonised patent rights. The market decides the fate of the system, albeit with minor regulation of visible excesses. Patent trolling, anti-trust and standards issues all come under scrutiny.

How might IP regimes evolve by 2025?

Market Rules	Whose Game?	Trees of Knowledge	Blue Skies
Business as dominant driver.	Geopolitics as dominant driver	Society as dominant driver.	Technology as dominant driver
The story of consolidation in the face of a system that has been so successful that it is collapsing under its own weight.	The story of conflict in the face of a boomerang effect that strikes the dominant players as geopolitical balances shift and competing ambitions emerge.	The story of erosion in the face of diminishing societal trust and growing criticism of the patent system.	The story of differentiation of the patent system in the face of global crises, societal reliance on technology and the threat of systemic risks.
Key questions			
Could ever-increasing volumes overwhelm the patent system?	What are the main drivers for future geopolitical change? How might they steer globalisation?	How can public and private interest in IP be reconciled for the benefit of society?	How can technical expertise be identified and measured? By whom?
Will the desire for patent rights continue to increase, or will there be new forms of IP protection?	What impact might this have on existing structures and institutions?	How are the ethical and moral dilemmas raised by technology reflected by the patent system?	How can valuable knowledge be protected in emerging and complex technological fields?
How might isssues of enforcement impact the further development of patent rights as a financial asset?	How might this impact the IP system globally and regionally?	Where should the limits to patentability be drawn? By whom?	Should the 'one size fits all' system be abolished to meet the needs of different technological sectors, where will the boundaries be drawn? By whom?
Does the patent system offer business protection in the face of ever-increasing competition?	**Does the patent system serve the global world fairly?**	**Does the patent system benefit society?**	**Can the patent system adapt to the changing nature and pace of technology?**
...and a way to test this is to see whether business maintains its use of patent protection in the era of globalisation.	...and a way to test this is to look at LDCs and other developing countries.	...and a way to test this is to see whether it achieves a balance between rewarding innovation and providing goods and knowledge to the public	...and a way to test this is to check whether a bifurcated system can better respond to the needs of technology and society.
What legitimacy might such a regime or regimes have?			
Business says "yes" to IP; other views are irrelevant.	No global legitimacy; competing national and regional IP systems.	No legitimacy for classic monopoly rights; legitimacy for open and collaborative innovation.	IP reform restores global legitimacy.

Whose Game? *a world where geopolitics is the dominant driver.*
This is the story of a boomerang effect which strikes today's dominant players in the patent world as a result of changing geopolitical balances and competing ambitions. The developed world increasingly fails to use IP to maintain technological superiority; new entrants try to catch up in order to improve their citizens' living standards. But many developing world countries are excluded from the process, and work instead within a 'communal knowledge' paradigm. Nations and cultures compete. The new entrants become increasingly successful at shaping the evolution of the system, using it to establish economic advantage, adapting the existing rules as their geopolitical influence grows. Enforcement becomes increasingly difficult and the IP world becomes more fragmented. Attempts are made to address the issues of development and technology transfer.

Trees of Knowledge *a world where society is the dominant driver.*
In this story, diminishing societal trust and growing criticism of the IP system result in its gradual erosion. The key players are popular movements – often coalitions of civil society, businesses, concerned governments and individuals – seeking to challenge existing norms. This kaleidoscope society is fragmented yet united – issue by issue, crisis by crisis – against real and perceived threats to human needs: access to health, knowledge, food and entertainment. Multiple voices and multiple world views feed popular attention and interest, with the media playing an active role in encouraging debate. This loose 'knowledge movement' echoes the environmental movement of the 1980s, initially sparked by small, established special interest groups but slowly gaining momentum and raising wider awareness through alliances such as the A2K (Access to Knowledge) movement. The main issue is how to ensure that knowledge remains a common good, while acknowledging the legitimacy of reward for innovation.

Blue Skies *a world where technology is the dominant driver.*
The final story revolves around a split in the patent system. Societal reliance on technology and growing systemic risks force this change; the key players are technocrats and politicians responding to global crises. Complex new technologies based on a highly cumulative innovation process are seen as the key to solving systemic problems such as climate change, and diffusion of technology in these fields is of paramount importance. The IP needs of these new technologies come increasingly into conflict with the needs of classic, discrete technologies. In the end, the patent system responds to the speed, interdisciplinarity and complex nature of the new technologies by abandoning the one size fits all model: the former patent regime still applies to classic technologies while the new ones use other forms of IP protection, such as the licence of rights.

The patent system increasingly relies on technology, and new forms of knowledge search and classification emerge.

Traditionally, the world of patents has been viewed through the *Market Rules* lens. But it is unwise to take decisions on the basis of just one possible future. We believe that viewing the other three worlds – too often ignored by many – will enable the system and those within it to better respond to the multiple pressures of the future.

The patent system, evolved over centuries to protect industrial technologies within a relatively small number of nations, is likely to have to adapt – perhaps radically. Globalisation – global competition – encourages more innovation as new products are marketed and sold worldwide. It also means more exchanges of ideas and technology, resulting in a challenge: how will we develop harmonised means to deal with the growing number of such exchanges? This is the world of *Market Rules.*

The system must also accommodate the multiple players and stakeholders from different cultures and with different worldviews who are working towards different goals within a global environment. The challenge here will be to find a way of meeting the specific developmental requirements of diverse nations at global level, because a system that blocks the access of poor people to essential drugs or food will impact the credibility of the system. This is the world of *Whose Game?*

Civil society is increasingly engaged in the IP debate, and this interest is likely to significantly shape the agenda of the 'commons' debate. As questions around the public benefits of IP gain traction, we enter the world of *Trees of Knowledge.*

The subject matter protected by the patent system is changing, too. Technologies become increasingly fast, interdisciplinary and cumulative, increasing the tensions on the patent system and leading us to *Blue Skies.*

These four scenarios illustrate the different ways the world of patenting and intellectual property could evolve. Each of these four worlds represents a series of trade-offs that will be made, and each will have winners and losers, advantages and disadvantages. In *Market Rules,* the interests of business will be paramount, and societal concerns are likely to be ignored most of the time. Occasionally, the odd excess in the system will be rooted out, but the business world will soon try and find new ways to exploit the use of their granted rights. Patents will become recognised as a financial asset, a critical means to maximise profits and support emerging lines of business.

What are the signals that would lead to this world?

Market Rules

Increasing business lobby pressures on government

Trees of Knowledge

Growing number of signal events and emotive societal issues

Whose Game?

Increasingly visible muscle of new entrants

Blue Skies

Growing tension between classic and novel technologies

What would constitute success in this world?

Market Rules

Speed and efficiency

Trees of Knowledge

Societal acceptance

Whose Game?

My society wins

Blue Skies

Technological diffusion and resilience

Enforcement

+++/+ IP rights are increasingly enforced, with injunctions and damages available worldwide and strengthened by international trade agreements. Digital copyright is strong and supported by sophisticated technical measures.

+ IP rights abolished in most fields, and enforcement is usually avoided where possible. Government interventions ensure pharmaceutical industry data exclusivity for clinical trials and cultural flat fees for the entertainment industry.

++/+ IP rights are only regionally enforceable because the appearance of trade blocks has led to mutual ignorance/rejection of IP rights. Within these blocks, however, depending on the prevalent system, enforcement can be quite powerful.

++ IP rights have lost their most powerful weapon in several technological sectors: the monopoly right. Patent owners in these sectors cannot stop copying but can demand licence fees, with arbitration and court actions if parties cannot agree on terms. In classical technological fields patents still confer monopoly rights.

Language

English has become the major patent language. Automatic translation facilities have significantly improved so that language is not really an issue anymore.

Due to the fact that patents have largely disappeared, language is no longer a major issue. In those few fields where patents still exist, language is still causing some problems in identifying relevant prior art. However, these difficulties are somewhat alleviated by the emergence of sophisticated (open source) machine translation.

Languages are only another area of segregation. Patent systems as far as they still exist use national or regional languages (e.g. English, Spanish, Chinese). Since the worldwide recognition of IP rights is seriously undermined and highly discriminatory, different language regimes only highlight this split. Translations remain important as a means for knowledge transfer, but increasingly also for technology espionage.

Computer translations are available from and into almost any language. Translation costs thereby have dropped to a negligible level. At the same time prior art is now accessible to any expert irrespective of his/her nationality due to the availability of computer translations. Language thus is no longer a barrier or cost driver in IP.

Comparing scenarios

	Market Rules	Whose game?	Trees of Knowledge	Blue Skies
Big business and government	Close partners, but business sets the agenda.	New businesses in emerging economies are backed by government.	Lack of trust in both MNCs and government.	New innovative networks and partnerships.
Climate and environmental pressures	Environmental issues largely ignored, tipping points not yet reached.	There is too much competition to allow concerns to be addressed. Tipping points imminent.	Continue to mount, leading to social movements and widespread protest.	Energy and water issues become critical.
Ethical issues	Largely ignored.	Global ethics challenged by national and cultural norms.	Dominant concern, both globally and locally.	General societal pragmatism; a utilitarian approach.
Role of experts	Experts work closely with lawyers.	Expertise valued as a competitive weapon.	Experts overruled by popular perceptions.	Narrow expertise is misleading; cross-disciplinarity essential.
Control of system	Clear rules and roles give the illusion of control.	Captured knowledge results in control.	Not controllable, occasionally foreseeable.	Determination of technological boundaries creates new arena of legal dispute.
Key skills required	Legal, commercial, managerial expertise.	Diplomacy and bargaining.	Negotiation and communication skills.	Legal, inter-disciplinarity and negotiation expertise.
IP is...	A financial asset.	A tool of national competitiveness.	A moral issue.	A means to rapidly share technological solutions to complex problems.

In the world of *Whose Game?* the dynamics will be determined by the changing geopolitical and technology landscape as patent money flows eastwards. As the West reacts, global structures will give way to regional trade blocks, with their differentiated IP systems. Since IP is viewed as a tool of national competitiveness, the winners will be the new players who are increasingly able to flex their geopolitical and technological muscle; the losers will be existing players forced to surrender their dominance. The fate of less developed economies will depend on how successfully they manage to use open source and their collective intellectual property rights.

In *Trees of Knowledge*, the decline of societal trust in multinational corporations and governments in an increasingly connected digital world will lead to the growing power of popular movements, a rainbow alliance of coalitions including civil society, businesses and governments. Although the issues and crises vary, the underlying theme remains access to health, knowledge, food and entertainment. New methods are devised to try to provide incentives to innovate while keeping knowledge in the public domain. The winners and losers will be defined by the results: who is able to innovate what – with the answer dependent on the quality of governance.

The world of *Blue Skies* will see the tensions between the novel technology sectors and the classic technological fields come to a head; there are likely to be many conflicts around the boundaries created between sectors and systems. Societal reliance on complex technological systems, in particular solutions to global ecological crises, will create a world that provides great opportunity for certain innovators. IP is the means to share technological solutions to complex problems, so the winners will be those able to adapt to the changing nature of knowledge and the speed of change – and survive in a global jungle.

At the start of this project, we asked ourselves two questions: "How might IP regimes evolve by 2025? What global legitimacy might such regimes have?" At their core, these are questions about the growing importance of knowledge. This set of four scenarios derived within the *EPO Scenarios for the Future* project aim to provide some clues as to how we might adapt to the fundamental changes in the way in which knowledge is being produced and used within global society ■

What does the IP world look like?

Market Rules
'Harmonised'
Patents have become global commodities. They constitute a recognised financial asset class in their own right, to be exploited and developed. The recognition of their value has become a new economic discipline. Patent professionals have considerable influence in the commercial world.

Trees of Knowledge
'Eroded'
In most technical fields patents have been abolished worldwide. Copyright is limited and restricted by fair-use exemptions. Secrecy, trademarks, design rights, geographic indicators, but also first-mover advantage and customer relationship are used to compete. Public private partnerships, prize funds, advance payment schemes and government grants reward innovators in areas of high public interest. Open source, creative commons and science commons are the standard forms of protection for work and attributions of authorship.

Whose Game?
'Split'
By 2025, IP is a still powerful tool, pragmatic adapted and used differently in various regions to achieve different goals. TRIPS is effectively marginalised.

The West devises alternative protection mechanisms to erect trade and IP barriers to respond to the rising competition from newcomers. Emerging countries are the top innovators and defend a strong global patent system. Some emerging and developing countries focus on collective intellectual rights and open source to try to manage their biodiversity heritage.

Most of the least developed countries (LDCs) ignore IP or use open source as the only route past the digital divide.

Blue Skies
'Reformed'
The new patent regime is characterised by a bifurcated system: in complex technical fields monopoly rights have been replaced by a licence of right regime while in discrete product areas such as the pharmaceutical sector classic patent rights continue to exist.

Alternative types of protection, such as branding or secrecy, often enforced by technical means (DRM) have become more important, but open source equally plays an important role.

Comparing health across the scenarios

As a basic human need, the way health issues are affected in all four scenarios is highly illustrative of their overall impact. The ways in which society, governments and industry deal with health-related issues vary strongly from one scenario to the other.

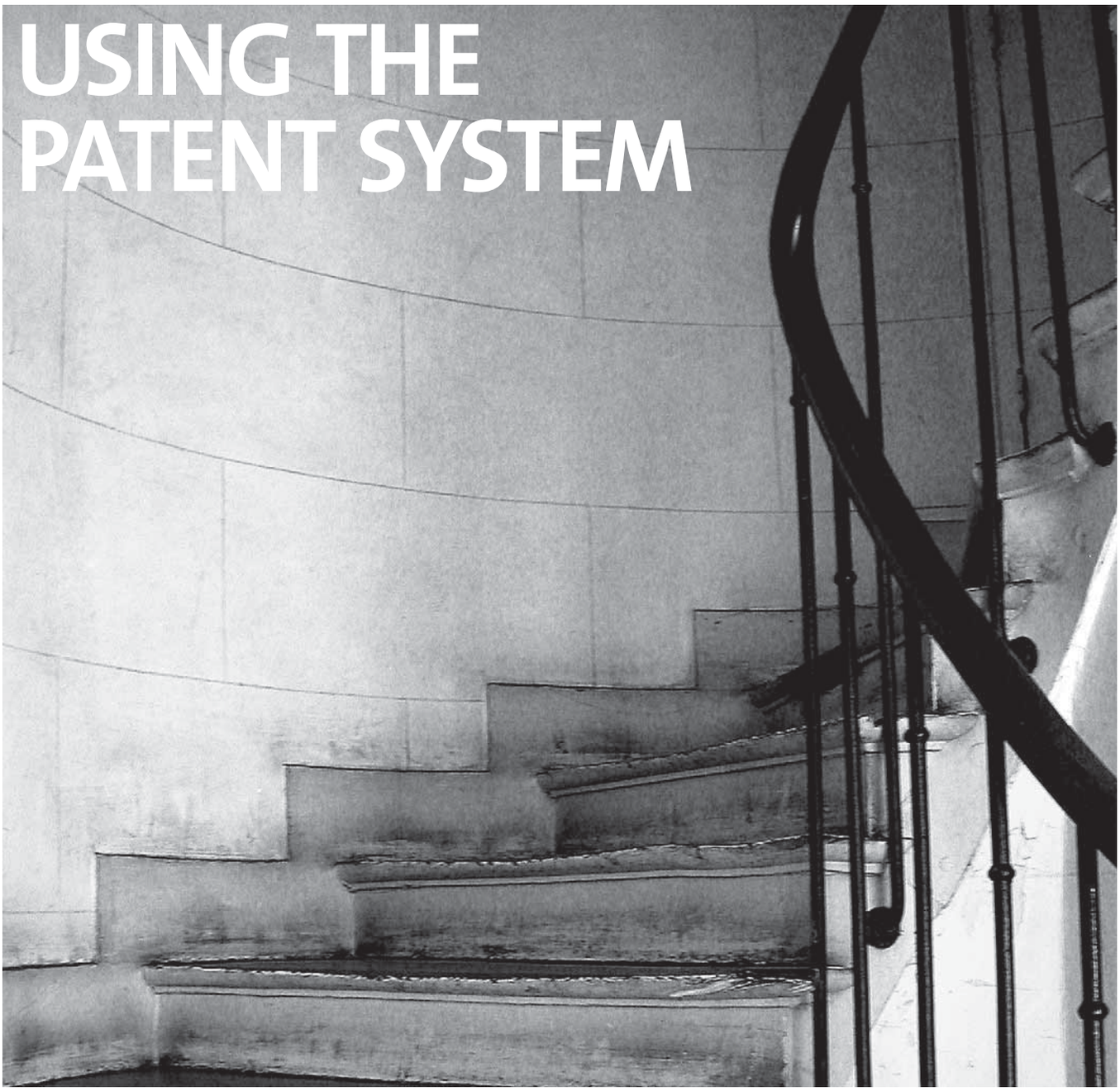
Market Rules
'The market should fix it'
Health becomes a private commodity, with insurance coupled to preventive behaviour and genetic modelling of patient groups. Individual responsibility for health is a ground rule. This provides potential for profitable markets, especially for the ills of an ageing population, expensive long-term treatments and lifestyle drugs. There is increasing emphasis on preventive diagnostics and pharmacogenomics leading to a highly individualised medicine. Marketing is the pre-eminent discipline of the drug companies and IP rights are strengthened using supplementary protection and data exclusivity. There is philanthropic funding of rare and neglected diseases. Stricter IP rules, enforced by bilateral agreements often surpassing TRIPS, and the increasing worldwide high-level harmonisation of IP rights, leave fewer 'white spots' on the patent map.

Whose Game?
'Battle for health'
The health sector, like all parts of the economy, has been dragged into the fierce competition between rising and existing powers. IP enforcement and counterfeiting have become weapons in the trade wars. Western pharmaceutical industries have mostly turned into copy-cat producers of drugs and treatments developed by the new, powerful economies because governments and health insurers can't afford to pay for the rights to expensive patented medicines. In many countries demographic pressures lead to social Darwinism and value-of-life analyses. Medical tourism – for those who can afford it – has reached new heights. While in the new powers a mostly state-governed health insurance system tries to secure basic needs, the traditional healthcare systems in the Western world are increasingly less able to cope with the rising costs. The global gap of medical haves and have-nots widens.

Trees of Knowledge
'Public benefit comes first'
Affordable access to health becomes a social clarion call, leading to the abolition of patents in the pharmaceutical sector and an enormous shift in investment. Some pharmaceutical companies with specialist know-how and marketing experience manage to survive; others pay for the costly clinical trials of drugs developed by the public sector, an investment that secures them some market exclusivity. The large, government-sponsored, research programs, however, struggle to address the most urgent health needs. Research based on 'ethically sensitive' technologies (such as germ-line modification) moves almost entirely to less prescriptive jurisdictions. But once effectiveness is proven, the public presses for relaxation of regulations. Alternative funding models for drug research, relying on push or pull mechanisms to promote innovation in fields considered to be relevant to public health, have emerged. But not all countries are able to deal with the increased influence of politics on research priorities, leading to problems with capture.

Blue Skies
'Technofix'
A globally positive attitude to technology has led to flourishing healthcare R&D. Pharmaceutical companies still rely on patents, albeit with restrictions that ensure research exemptions and access for poorer nations. Areas such as genetic diagnostics have adopted a system of licensing, patent pools and clearing houses to ensure optimal use of available technologies. But major breakthroughs come from a thriving ICT sector that enables new forms of disease prevention by combining sophisticated diagnostics, advice and the control of human behaviour using technology. Epidemiological, pharmaceutical and genetic research is helped by huge interconnected databases bringing genomic, clinical, familial and social data together on a worldwide scale. Ethical objections to biotechnology have made way for 'utilitarian' cost-benefit appraisal: stem-cell treatments, advanced prosthetics and embryo screening are accepted. The first attempts at genetic enhancement are supported in large parts of society.

USING THE PATENT SYSTEM



The journey from inventive idea through to earning a reward is relatively straightforward – or would be if all the world's systems were the same; which, of course, they are not. Thus, after having an idea, an inventor will normally ask the same basic questions: what am I able to protect?; where can my idea be protected?; how do I obtain this protection?; what steps do I have to take?

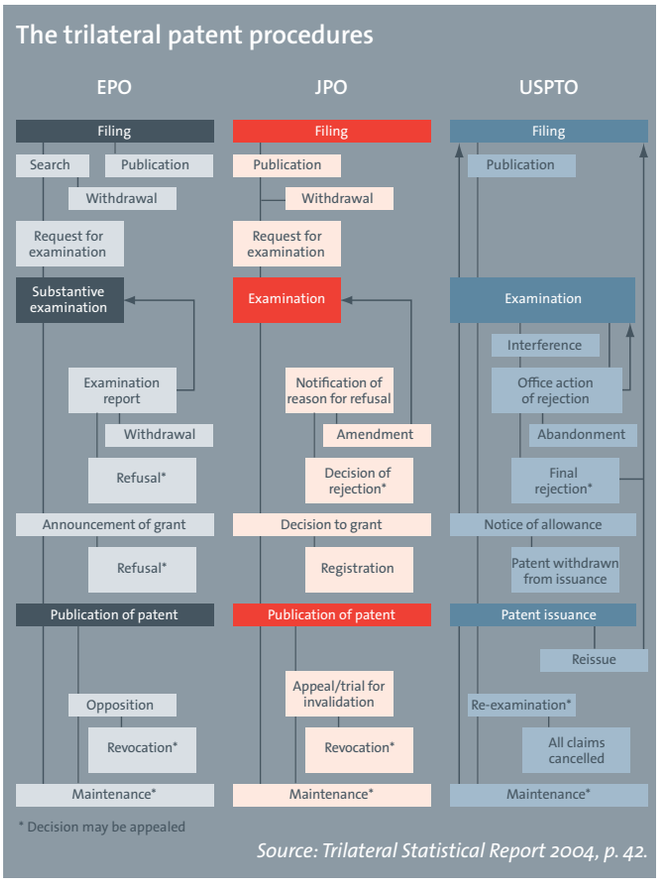
A patent is a right to exclude all others from making use of an innovative product or process in a particular territory, during a particular time period (typically 20 years), and is a right granted under the laws of that territory. But this doesn't mean that a patent gives a right to use or sell the product or process itself – it may, for example, take years to get licensing authorities' permission to market new drugs. Countries may also (but, in practice, rarely) enforce the compulsory licensing of a product or process to others where the national interest dictates, e.g. health emergencies where the patent holder cannot meet demand or the cost is too high a burden. A monopoly should not therefore be seen as the necessary result of a patent.

What am I able to protect?

The definition of what sort of things can be patented is a point of great debate. Some jurisdictions, such as the US, allow patents for software and business methods but these are not allowed in European countries – although a program which is not software per se (which could be protected by copyright law) may be allowed if it has a technical effect. Similarly, ethical and legal objections are frequently raised against the patenting of medical and genetic innovations, with India, for example, only recently having allowed the patenting of pharmaceuticals. The US is generally open to patenting "everything under the sun made by man," but each territory sets its own laws.

Disclaimer: Please note that this chapter provides a short illustrative review of the patent system. For more detailed advice please take legal advice or contact the EPO directly.

Right: Opportunities to rationalise? For companies looking to exercise patents across the world, the differing procedures of the main patent-awarding bodies create administration and legal headaches.



Source: Trilateral Statistical Report 2004, p. 42.

Most jurisdictions apply the same basic criteria of novelty, non-obviousness, usefulness and not being otherwise excluded by the laws in force. In Europe, for instance, the European Patent Convention (EPC) disallows anything which is against morality and ordre public. In Europe also, methods of treatment or surgery acting on the human body will not obtain patent protection, although the instruments and products used may. The application of finer or more controversial points may still reside with the national jurisdictions.

One area of contention is the resolution of the question of who is entitled to a patent if two inventors apply around the same time for what is essentially the same invention – assuming that this is a genuine coincidence and that no illegal corporate espionage has to be judged by the courts. In the US, the rule is that the first to invent wins and the decision may involve legal proceedings looking at the research logs of the parties. In Europe, and most other jurisdictions, it's a case of first to file, i.e. the first person to get their application to one of the offices is the one who will win the prior right. The different methods form one area which currently prevents a harmonisation of the different patent systems – one side will have to change to allow convergence.

Where can my idea be protected?

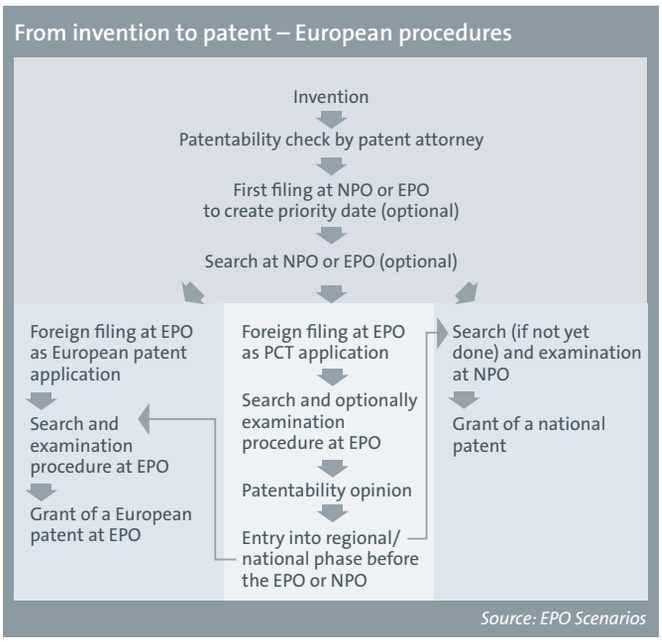
Given the increasing globalisation of trade, an inventor may seek protection in a number of countries.[1] But each inventor (or 'applicant') must nevertheless satisfy the patent laws of each individual territory. The World Trade Organisation (WTO) agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) has introduced intellectual property rules whereby the WTO's 150 member countries are required to comply with certain minimum standards for the protection of IPR.

An international agreement, the so-called Paris Convention, originating in 1883 and now administered by the World Intellectual Patent Organisation (WIPO) in Geneva, ensures that an earlier problem of not being able to be in two places at once – and thus not being able to apply for a patent in a number of countries simultaneously – has been overcome. Delays of days or weeks as an inventor did a world tour of patent offices are a thing of the past and now it is sufficient to apply first in any one of the 171 signatory countries of the Paris Convention to automatically obtain a one-year period from that priority date to go to the remaining offices. The applicant will be in the strong position of having an effective filing date of the first filing date.

How do I obtain this protection?

The procedure thereafter is 'simply' a question of gaining approval or obtaining the grant of a patent in each country. But the administrative procedures can take a number of parallel and sometimes criss-crossing paths. The seemingly simplest procedure is to deal directly with the national patent office of each country by filing individually at each office. But this may, and almost certainly will, require the hiring of legal representation in each country, if only for dealing in a foreign language with the relevant bureaucracy. Carrying out the procedures before each office may still involve the need to be in two countries at the same time or paying two or more fees to two or more banks accounts in two or more countries on the same day. In reality this method is very time-consuming, almost impossible and very expensive.

Thus alternative routes have been developed. The Patent Cooperation Treaty (PCT), also administered by WIPO, allows a degree of harmonisation of those countries' separate procedures.[2] It allows an applicant to apply in one of its 136 members (or at the International Bureau (IB) in Geneva) and so simultaneously to start a procedure in as many of the 136 as desired – one filing, one set of criteria to meet, one payment and one language (from the PCT's eight permitted languages: Arabic, Chinese, English, French, German, Japanese, Russian and Spanish). Thereafter, the application can be the subject of an International Search and an International Preliminary Examination at one of the PCT's 12 International Search (ISA) and Preliminary Examination (IPEA) Authorities (Australia, Austria, Canada, China, the EPO, Finland, Japan, Russia, South Korea, Spain, Sweden and the US) for the purpose of obtaining an International Preliminary Report on Patentability under Chapter II of the PCT (IPRP Chapter II).[3] The choice of ISA/IPEA depends on the applicant's country of residence, each country having nominated one or more of the offices as an allowable office for its applicants (e.g. the US has chosen US, EPO and South Korea). The procedure allows the application to be treated as a patent application under common rules and amendments can be made to ensure that the application has a good chance



Above: The different procedures. An applicant in Europe can choose to follow a national (NPO), regional (EPO) or international (PCT) procedure – or any combination of the three.

of being ready for grant when entering the national phase before each separate patent office. Of course, the requirement of a common set of rules may mean that some differences of law or interpretation will exist or some further examination will still be required in the national phase, as the IPRP is not binding. Thus the IPRP can be taken to the patent offices of the countries 'elected' from the 136 available and presented as an aid to speeding up the subsequent proceedings. But the IPRP is not a granted patent.

In addition to this, however, a further path exists whereby the countries of some regional groupings, such as the member states of the EPO, allow a further consolidated procedure. This can occur either after the PCT procedure above or instead of it (and in parallel with national applications for the rest of the world). A European Patent can be sought for any number of the EPO's 32 member states and again search and examination will take place to decide whether the 'invention' satisfies the common law of the EPC, which will lead to the grant of a European Patent. The search and examination, if being performed after the PCT procedure, will be of a more limited nature and will receive fee reductions. Like the PCT procedure, this regional procedure requires only one filing, one set of criteria to be met, one payment and one procedural language (but now only English, French or German).

In fact, the European Patent is a bundle of individual patents which belong to the chosen member states who, after grant, assume responsibility for the patent, but the EPO offers a unified procedure up to the point of grant. To summarise, after selecting the countries in which protection is sought,[1] the options are:

a) to apply to the national office of each country separately and follow their procedures;
b) to group some national applications at regional offices, such as the EPO; and
c) to apply via the PCT for some or all of the countries and then proceed to a combination of regional and/or national offices, the regional offices leading automatically to national offices.

What steps do I have to take?

Once the formalities are dealt with and the relevant fees paid, the granting procedure can begin. In all systems the grant of a patent requires the publication of the application as a balance between giving an advantage through a patent right and enabling society to develop these new ideas even further by disseminating knowledge.

In most cases publication takes place just over 18 months after first filing although, naturally, there are exceptions, e.g. in the US for applications which do not have non-US parallel applications for which no publication is necessary.

The procedure before grant, or refusal, generally involves two stages – the discovery stage of search wherein any possible reason ('prior art') for not granting should be uncovered, normally involving work by the patent offices' examiners, and a substantive examination stage in which the precise effect of this prior art is considered. Eventually an allowable wording of, in particular, the claims may be achieved which will permit a grant after, if necessary, an oral as well as the more frequent written procedure has taken place. It should also be noted that some offices do not apply any such procedure, as the system of granting only involves a registration system.

During these stages, third parties may file observations in order to assist proceedings – normally to suggest why a patent should not be granted, by supplying documentary evidence – but a deeper involvement for them is only possible after grant in an opposition process. At the EPO, this can only occur during a limited nine-month period after grant and before the patent becomes a bundle of separate national patents under the competence of the national offices. Of course an opposition at the EPO avoids separate proceedings in up to 32 countries' courts and, possibly, 32 different interpretations and decisions.

And then what do I do with my patent?

After grant the patent holder is free, within the previously stated limits, to do as he will with the right and this generally involves using the invention himself, licensing the invention to others in return for a fee or cross-licensing the invention with another patent holder.

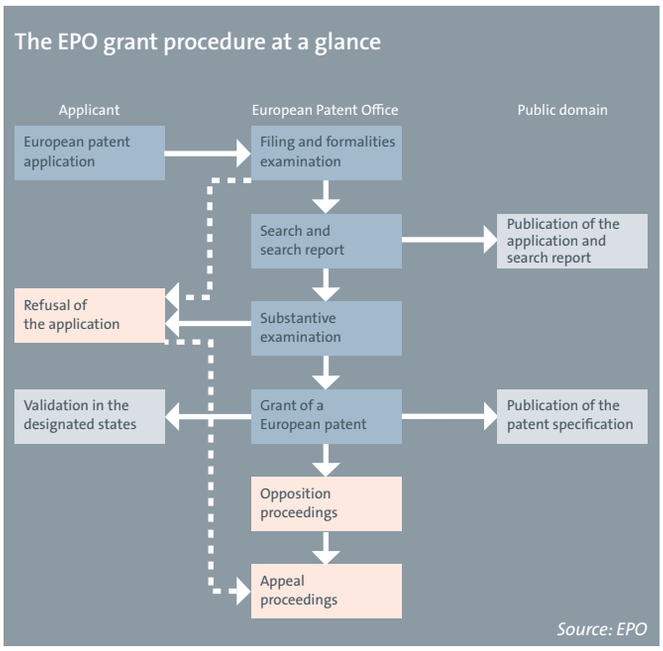
The patent holder may, however, be altruistic and allow anyone to use the invention – the patent may have been sought so as to prevent somebody else from obtaining the exclusive right – but it is the patent holder who dictates the use or not of the invention.

Needless to say, infringement of patents and the resulting enforcement or legal proceedings can only, at the moment, take place in the country concerned since the law being infringed is a purely territorial law – there are no current cross-border litigation proceedings although, in Europe, steps have been taken to set up such a procedure. The costs involved vary from country to country depending on the legal procedures available and often the litigation will be met with a counter-claim for invalidation of the granted patent, i.e. even if I am infringing, the right should never have been granted to you in the first place.

The EPO system in focus

A patent application may be filed at the EPO – or in any of the EPO's currently 32 member states – in any of the official languages of the EPO's member states. This must be available in one of the three official languages (English, French and German) within a given period. This language will then be the language of all future proceedings.

The application will face an initial examination on filing and formalities requirements (including the language question) and, thereafter, a search will be carried out by the EPO to identify relevant prior art. Substantive examination of the patentability of the claimed subject matter may then start in a second phase of the procedure of grant or refusal. No grant can occur, however, before publication of the application by the EPO. This publication normally occurs immediately after 18 months have passed from the application's earliest priority date, although an applicant may request an earlier publication date. The publication starts a period in



Above: The European Patent procedure. The regional procedure within Europe leads to a bundle of national patent rights, which then have to be validated by the applicant at the national level.

which the applicant must indicate in which of the EPO's members states protection is sought (and in which of the five extension states).

If the application is deemed allowable, without the need for significant amendment, by the three-member examining division, the division will propose a grant. The applicant will then be required to pay the relevant fees and to perform some formalities, such as translation of the claims into the two remaining official languages, before the patent specification can be published.

However, if the application is not considered to meet the requirements of the European Patent Convention (EPC), an exchange of communications will occur between the examining division and the applicant or his representative, if necessary by means of a face-to-face meeting in an interview or a more formal oral proceeding. At least the first, and normally most, communications are in written form. This procedure results in the grant or refusal of the patent application.

The EPO's system provides the possibility for third parties to make comment during these proceedings, in particular by providing documentary evidence which shows why a patent should not be granted. Electronic on-line databases allow the procedure to be followed by these parties. If the third parties are not satisfied with the outcome, it is possible for them to file an opposition within a limited period after the indication that the patent is to be granted. They will then become parties to the procedure and have the right to be heard in presenting their grounds for opposing the grant of the patent.

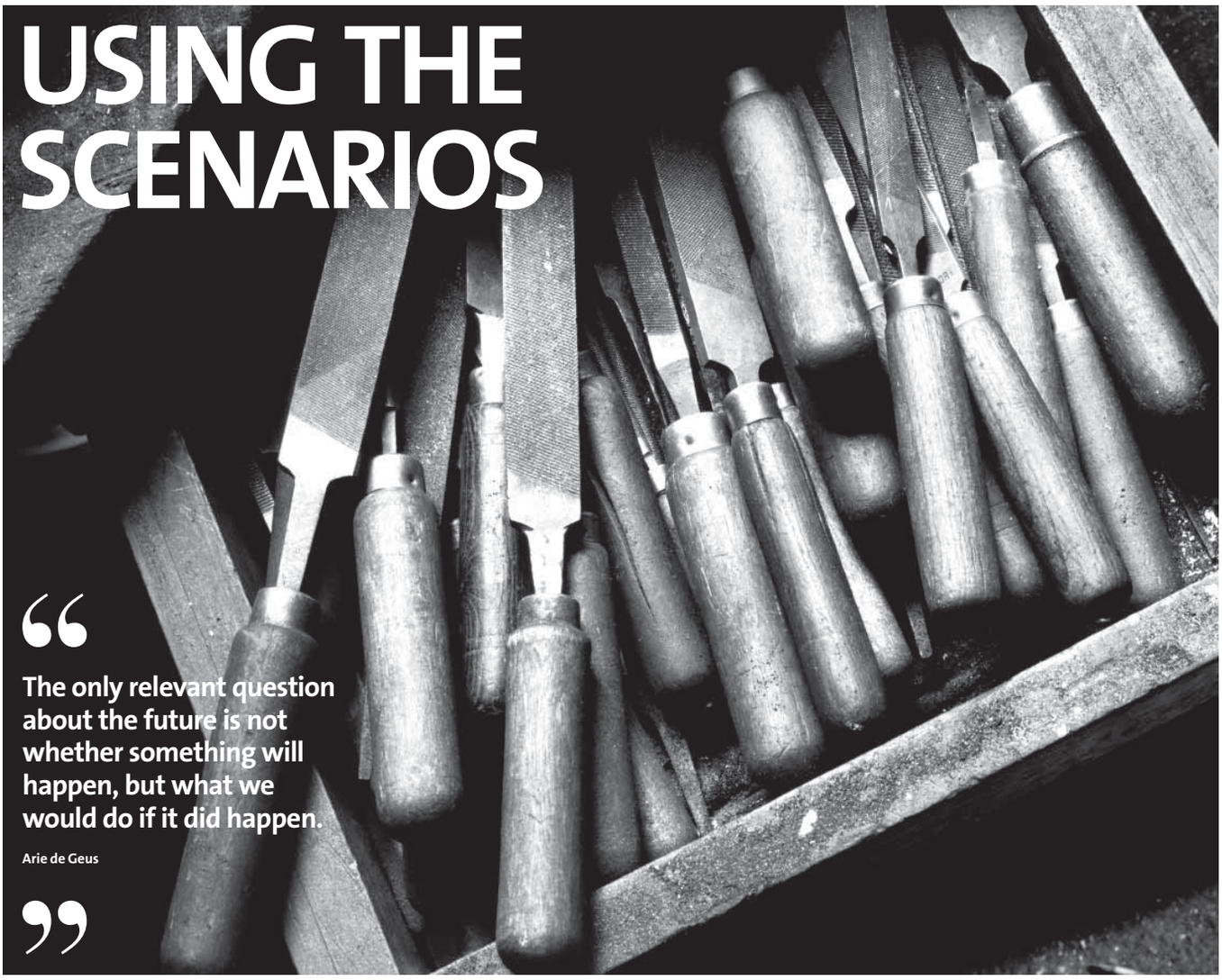
A different three- or, occasionally, four-member opposition division will decide on the merits of the opposition and this will lead to revocation of the granted patent, maintenance of the patent in an allowable amended form or rejection of the opposition. If the grant is considered to be allowable, the formal procedures will again be instigated.

A decision which negatively affects any party can be the subject of an appeal by that party, which appeal will be heard by a Board of Appeal and, in exceptional circumstances, by an Enlarged Board of Appeal if a particular point of law is referred to that Board.

After all procedures before the EPO have been exhausted, the granted European Patent becomes a bundle of patents before the national offices of the member states which the applicant has previously selected. The national offices thereafter have sole competence for the patent in their territory and have their own requirements for validation of the patent – translation, if necessary, and payment of further fees. Any infringement of the patent or even further objections to the patent's validity must be prosecuted under the national laws and in the national courts ■

Note: The EPO system will change in late 2007 with the introduction of EPC 2000, an amended European Patent Convention, which has a significant number of changes. In particular, the requirements when filing will change such that the filing language restrictions (mentioned above) will be loosened.

USING THE SCENARIOS



> **The only relevant question about the future is not whether something will happen, but what we would do if it did happen.**
>
> Arie de Geus

Facing uncertainty

Change is the only certainty in an uncertain world. These changes can be either radical discontinuities or gradual shifts in context – either way, they will force a reaction. In the face of constant change, there is a choice between reacting to circumstances or proactively planning for possible future outcomes.

The future success of any system or organisation will depend on the robustness of the decisions taken today. What these choices will be will depend on the assumptions made about the future. In the face of major uncertainty, a common psychological response is to withdraw in the safety of what we are comfortable with, what we already understand about the world, our mental models. More often than not, our understanding of the world is always partial, because it is based on our training and experience. So these mental models are limited to familiar ideas based on past experiences, projected into the future. Our perception of the world provides the foundation for anticipation of how the future might unfold. This reliance on the familiar could mean that we miss potential opportunities, or that our blindspots expose us to unforeseen eventualities.

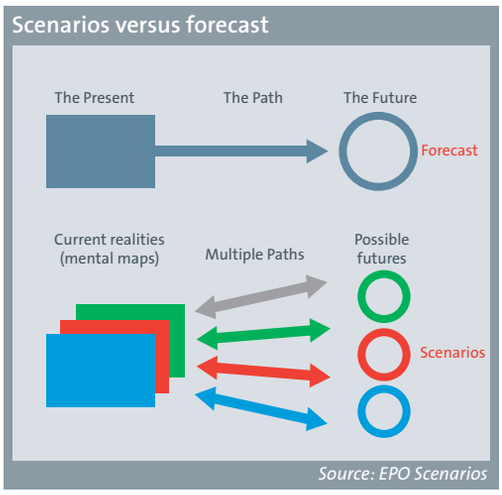
In certain cases forecasting – research, analysis and better planning – can provide a sufficient answer. Econometric methods have become increasingly sophisticated, and there are many powerful new tools and software programs able to process vast amounts of data. However, most forecasts are based on linear cause and effect relationships. This assumes that the world of tomorrow will look like the world of today, which can be dangerous when projecting forward to the medium or long term. Where forecasts tend to be most critical is where there is any likelihood of a radical discontinuity or major shift that would render whole strategies obsolete.

When the context in which an organisation or system is operating is rapidly changing or the questions relating to a particular issue are too complex or uncertain, scenarios come to the fore. In these cases, it may be that the data is such that it cannot be quantified or analysed, or that there are conflicting perceptions or opinions held on the subject. Instead of analysing a problem in isolation, scenarios look at the system as a whole seeking to understand interconnectedness, complexity and wholeness of components of systems in specific relationship to each other. The whole is greater than the sum of the parts.

History of scenarios

The emergence and use of scenario practises has been with us for at least 40 years, evolving from its historic military use as war games. During and after WWII, the RAND corporation started applying it to the civil domain. Herman Kahn, who had worked at RAND, developed the methodology further, but it was still based on a predict and control model. In the early 1970s scenarios were adopted by Shell for their futures planning by Pierre Wack, then head of strategy at Shell.

The methodology was adapted to include qualitative as well as quantitative thinking, in an attempt to better understand the changing structures in society. Scenarios became more widely recognised after Shell successfully anticipated the oil crises, and Shell have consistently used the methodology ever since. Scenarios have subsequently been used by many private and public sector organisations, governments and civil society groups to better understand how the future might unfold. Well known examples include the Montfleur scenarios, used to find a peaceful transition of power in South Africa.



The Shell approach is the one utilised to build the EPO Scenarios for the Future, as both project leader and consultants have been trained within Shell.

What are scenarios?

A scenario can be described as 'a story about what happened in the future.' This story comes as one of a set of scenario stories. They are not forecasts, preferences or predictions about the world around us, but relevant, plausible and challenging stories of how the future might possibly unfold. These futures include a number of dimensions over which the organisation has no control; including economic, political, societal, environmental, technological and historical dimensions.

Scenarios are a tool to encourage strategic conversation and enable iterative analysis. They provide a framework that different stakeholders can use as a simulation too, in order to test different options. They enable the organisation to ask wide ranging questions, on which robust strategies can be developed that provide suitable answers.

It is important to consider the scenarios as a set, as the insights come as much from comparing and contrasting them as from exploring implications of each. Collectively, they provide a framework for examining the system as a whole and highlighting the key driving forces that are likely to influence the evolution of the patent and IP system irrespective of which future unfolds.

Building scenarios

Scenarios can be built in a number of different ways. As the context for each scenario is specific, and the environment in which it operates constantly changing, building scenarios demands continual innovation and creativity. They can be built in several different ways, namely: deductive, intuitive, incremental or normative and the approach selected will depend on the purpose, available resources as well as the nature of the scenario builders. An inductive approach produces scenarios from assembling a series of possible events. The deductive approach utilises a structured framework from which possible scenarios can be derived. The incremental approach surfaces and describes an 'official future' (a certain future that the organisation will assume to take place) before exploring possible alternatives to this. The normative approach starts with a set of characteristics at the end of the time horizon and then works backwards to see how such a future could come into existence and whether this could be plausible.

Scenarios are a decision-making tool. They assist an organisation to plan ahead without having to predict things that were inherently unpredictable. This is done by separating what was predictable from what was uncertain. The predictable elements are called predeterminеds, i.e. known facts about the future such as demographics or geographical information. The uncertain elements are the driving forces which would play out differently in the various scenarios. They are a combination of the most important economic, political, societal, environmental, technological and historical dimensions.

Scenarios are a collective exercise. The more they incorporate varied perspectives of how the future might unfold, the more robust they are likely to be. The process is a multidisciplinary: by drawing on many disparate visions of the future it aims to provide a more aggregate picture of the whole.

A major part of the scenario-building process is the learning journey that every scenario builder undertakes. There is little doubt that those involved in the scenario process will look at the environment and context with new eyes, and observe characteristics and signals in the present that had previously gone unnoticed.

Using scenarios

Scenarios can be used in a number of different ways:

- **Exploration**
  There are many cases where issues are simply too complex to be examined easily from the perspective of any particular discipline, and scenarios offer a unique way of making sense of complex problems by expanding vision through combining knowledge from many perspectives. They help us to recognise uncertainty: not just what we don't know, but – even more importantly, what we don't know we don't know. They help us to address blind-spots we might have, such as issues that we individually or collectively fail to recognise as important to our aspirations.

- **Building shared understanding**
  Scenarios have a role to play in initiating and sustaining dialogue among different stakeholders. They have often be used to deal where there are conflicting worldviews, because the process of projecting into the future and examining multiple possibilities can create understanding between discordant opinions and help parties to address dilemmas and conflicts more constructively.

- **Strategising**
  Scenarios are a useful tool to aid decision-making and improve policy-making. They can create a platform from which policymakers and different stakeholders can ask: "What if?" By having several possible futures it is possible to better frame the questions and challenges we face. Looking proactively at the future can assist organisations to anticipate crucial events, prevent critical mistakes and their consequences. They provide the contexts within which decision-makers – individuals and teams, public and private – might operate in the future.

Using the EPO Scenarios for the Future

The scenario stories in this compendium are global ones, intended to increase understanding of the different dimensions and nature of uncertainty in the world of patents and intellectual property. But in order to develop strategy, the more focussed the scenarios, the more evident their strategic implications will be. Global scenarios on their own set the scene and create the overarching framework, but for useful strategic conversations it is best to augment the scenarios with the relevant detail.

This can be done by various groups or stakeholders, ideally in a workshop setting. Divide the workshop participants into groups and ask each group to examine what the strategic implications would be for their particular scenario: what would work well, what would be most effective. By then bringing the groups together it is possible to examine what strategic options would work well across all scenarios, and therefore provide a sound option for the future. This process will require some iterations, as the groups examine what events would challenge a particular strategy and what adaptations would be required to make it more robust.

Scenarios are not predictions of the future, but by testing strategic options and using the scenarios as a tool to map possible futures, decision makers can structure their decisions and guide their thinking about the future ■

GLOSSARY

Disclaimer: *This glossary aims at helping to understand some of the terms used in this publication. While every effort has been made to ensure that they are accurate, the definitions in this glossary are presented for illustrative purposes only. It is not a comprehensive list.*

Administrative Council: Organ of the **European Patent Organisation** which supervises the European Patent Office.

Applicant: Natural or legal person applying for a **patent**, who, in most countries, need not be the inventor.

Bretton Woods system: International monetary management establishing the rules for commercial and financial relations among the world's major industrial states. Preparing to rebuild the international economic system as World War II was still raging, 730 delegates from all 44 Allied nations gathered at the Mount Washington Hotel in Bretton Woods, New Hampshire for the United Nations Monetary and Financial Conference. The delegates deliberated upon and signed the **Bretton Woods Agreements** during the first three weeks of July 1944 and established the International Bank for Reconstruction and Development (IBRD) (now one of five institutions in the World Bank Group) and the International Monetary Fund (IMF). These organizations became operational in 1946 after a sufficient number of countries had ratified the agreement.

Citations: List of references, believed to be relevant **prior art**, which may be taken into consideration in deciding whether the invention to which the application relates is new and involves an inventive step.

Civil society organisations (CSOs): The World Bank defines civil society as "the wide array of non-governmental and not-for-profit organisations that have a presence in public life." See also **Non-Governmental Organisations (NGOs)**.

Claim(s): Element(s) of the application defining the matter for which protection is sought.

Compulsory licence: Permission granted by a judicial or administrative authority allowing for the use of the subject-matter of a patent without the authorization of the patent owner.

Continuation: Application filed with the **USPTO** which is the second application for the same invention claimed in a prior non-provisional application. It has to be filed before the first application is abandoned, withdrawn or granted. Under certain circumstances, it is entitled to the benefit of the filing date of the prior-filed non-provisional application. See also **Divisional Application**.

Contracting States: States which are members of the **European Patent Organisation**. Current members (at 01.04.2007) are: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hellenic Republic, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Monaco, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

Convention on Biological Diversity (CBD): International treaty that was adopted at the Earth Summit in Rio de Janeiro in 1992, having as its main goals the conservation of biological diversity (or biodiversity), the sustainable use of its components and the promotion of a fair and equitable sharing of benefits arising from genetic resources.

Copyright: Exclusive right granted by statute to the author of a certain literary or artistic work. Copyright protection exists from the moment of creation.

Cross-licensing: Agreement in which two or more patent owners grant mutual **licences** to each other so that each of them becomes licensor and licensee at the same time.

Database Right: Exclusive right granted by statute to the author of a collection of independent works, data or other materials arranged in a systematic or methodical way and individually accessible by electronic or other means who has made a qualitatively or quantitatively substantial investment in its production.

Designated countries: Countries in which European or International patent applicants wish to protect their inventions.

Designation of Origin: Geographical description used to describe an agricultural product or a foodstuff originating in that region, specific place or country, the quality or characteristics of which are essentially or exclusively due to a particular geographical environment with its inherent natural and human factors, and the production, processing and preparation of which take place in the defined geographical area. See also **Geographical Indication**.

Disclosure: Divulgence of the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art, which an applicant must make in the patent application in return for the possible grant of a patent.

Divisional Application: Application filed with the **EPO** which may be filed only in respect of subject-matter which does not extend beyond the content of the earlier application as filed. It shall be deemed to have been filed on the date of filing of the earlier application and shall enjoy any right of priority. See also **Continuation**.

Doctrine of equivalents: Claim interpretation aiming at avoiding too much emphasis on the literal wording of the claims. It extends the protection of a claim to cover also elements which perform substantially the same function in substantially the same way and with substantially the same result as the element expressed in the claim, or which, from the perspective of a person skilled in the art, obviously achieve the same result as the element expressed in the claims.

Ethical Practice: System applying an internal set of rules when activities cannot be protected by intellectual property law.

European patent: Patent which can be granted for some or all of the **EPC** Contracting States (and extended to some or all of the **Extension States**). As a general rule, it shall, in each of the Contracting States for which it is granted, have the effect of and be subject to the same conditions as a national patent granted by that state.

European Patent Convention (EPC): Convention on the Grant of European Patents, signed in Munich 1973 and entered into force in 1977. An overhauled version of the Convention as adopted by a Diplomatic Conference in November 2000, the European Patent Convention 2000 (EPC 2000), shall enter into force on 13 December 2007, at the latest.

European Patent Judiciary (EPJ): International organisation to be set up by the **European Patent Litigation Agreement (EPLA)** to settle litigation concerning the infringement and validity of European patents effective in one or more of the Contracting States, which will comprise a supervisory body (Administrative Committee) and the European Patent Court (comprising a Court of First Instance, a Court of Appeal and a Registry).

European Patent Litigation Agreement: Agreement, currently in draft form, for an integrated judicial system, competent for the settlement of litigation concerning the infringement and validity of European patents, having a common European Patent Court and a European Patent Court of Appeal within a new independent organisation, the **European Patent Judiciary (EPJ)**.

European Patent Office (EPO): Organ of the **European Patent Organisation** which conducts a centralised patent grant procedure under the **European Patent Convention (EPC)**.

European Patent Organisation: Regional organisation established by the **European Patent Convention (EPC)** which administrates a centralised patent grant procedure. It has two organs, the E**uropean Patent Office** and the **Administrative Council**.

Extended European search report: Document containing the **Search report** and a non-binding opinion as to the patentability of the claimed invention.

Extension States: Non-EPC **Contracting States** which recognise the effects of **European Patents** and European patent applications. Current states (at 01.04.2007) are Albania, Bosnia and Herzegovina, Croatia, the former Yugoslav Republic of Macedonia and Serbia.

First to file system: Patent system in which the first natural or legal person having filed an application for a patent is entitled to the patent. This is the case in the European and Japanese patent systems.

First to invent system: Patent system in which the first inventor is entitled to the patent, regardless of who was the first person to file a patent application. This is the case in the US patent system.

Free Trade Area: Area resulting from a **Free Trade Agreement (FTA)** between two (bilateral) or more (regional: **RFTA**) countries, agreeing to eliminate tariffs, quotas and preferences on tradable goods and services between them.

General Agreement on Tariffs and Trade (GATT): Agreement originally created by the Bretton Woods Conference as part of a larger plan for economic recovery after World War II, with the purpose was to reduce barriers to international trade. The functions of the GATT have been replaced by the World Trade Organization (WTO) which was established through the final round of negotiations in the early 1990s.

Geographical Indication: Geographical description used to describe an agricultural product or a foodstuff originating in that region, specific place or country, and which possesses a specific quality, reputation or other characteristics attributable to that geographical origin, and the production or processing or preparation of which take place in the defined geographical area. See also **Designation of Origin**.

Grace period: Limited period of time before the first filing of a patent application during which the publication of the invention is not considered to be comprised in the state of the art. The US has a one-year grace period, Japan has a six-month grace period, and the **EPC** recognizes no grace period as such.

Infringement: Unauthorised use of a patented invention.

Integrated Circuits rights: Exclusive rights conferred to the holder of a product in which the elements and some or all of the interconnections are integrally formed in or on a piece of material which is intended to perform an electronic function.

Intellectual property rights (IPR): Exclusive rights conferred to protect certain creations of the mind. The four main types of intellectual property rights are: patents, trademarks, design and copyrights.

International Monetary Fund (IMF): see **Bretton Woods system**.

International patent application: Patent application filed under the **Patent Cooperation Treaty (PCT)**.

International Patent Classification (IPC): Patent classification system based on an international multilateral treaty administered by **WIPO**, which provides a common classification for patents according to technology groups.

Inventive step: Patentability requirement according to which an invention shall be considered as patentable if, having regard to the state of the art, it is not obvious to a person skilled in the art.

Japanese Patent Office (JPO): Agency of the Ministry of Economy, Trade and Industry (METI), which administers the examination and grant of patent rights in Japan.

Less Developed Country (LDC): The Committee for Development Policy (CDP) of the UN Development Programme identified 50 countries in the world with the lowest state of development, including low income level, low stock of human assets and high economic vulnerability.

Licence: Agreement by which the owner of a patent confers permission to other(s) to carry out an action which, without such permission, would infringe the patent. A licence, which can be exclusive or non-exclusive, does not transfer the ownership of the invention to the licensee.

Licence of right: Agreement concluded on the basis of a statement filed with a patent office by the patent owner declaring that he is prepared to allow any person to use the invention as a licensee in return for appropriate compensation.

Lisbon Agenda: Strategic goal for the European Union in order to strengthen employment, economic reform and social cohesion as part of a knowledge-based economy, adopted by the European Council in Lisbon on March 2000.

London Protocol: Agreement concluded in London on 17 October 2000 and to date approved by the parliaments of eleven **EPO** Member States, aiming at reducing the translation costs for European patents. In order to enter into force, it is currently awaiting ratification by France.

Millennium Development Goals (MDG): eight goals that 191 United Nations member states have agreed to try to achieve in order to end extreme poverty in developing countries by 2015.

Moral Right: Right conferred to the creator of a copyright to claim authorship of the work and to object to any distortion, mutilation or other modification of, or other derogatory action in relation to the said work, which would be prejudicial to his honor or reputation.

Non-Governmental Organisations (NGOs): Organisations not directly part of the structure of governments and which, usually, exist to further the political or social goals of their members. Examples include improving the state of the natural environment, encouraging the observance of human rights, improving the welfare of the disadvantaged, or representing a corporate agenda.

Ordre public: Concept developed in private international law meaning the essential and fundamental principles on which a legal order is based. Relevant with regard to the EPC as European patents shall not be granted in respect of inventions the commercial exploitation of which would be contrary to ordre public or morality.

Organisation for Economic Co-operation and Development (OECD): International organisation of those developed countries that accept the principles of representative democracy and a free market economy. It originated in 1948 as the Organisation for European Economic Co-operation (OEEC), to help administer the Marshall Plan for the reconstruction of Europe after World War II. Later its membership was extended to non-European states, and in 1961 it was reformed into the Organisation for Economic Co-operation and Development.

Orphan drugs: Drugs which give rise to tax benefits and monopolies offered by the US government (where they are aimed at one of the 5,000 diseases which affect fewer than 200,000 sufferers) and the EU, through the European Medicines Agency. The benefits encourage research which would not otherwise be financially viable.

Paris Convention for the Protection of Industrial Property: Convention dated 20 March 1883 and administered by **WIPO**. It created a system according to which an applicant was granted a right of priority after a first filing, for the purpose of filing in other countries.

Passing Off: In some jurisdictions, such as in UK law, illegal acts consisting of the misrepresentation that the defendant's goods or services are those of a competitor, usually by means of using a similar mark.

Patent: Intellectual Property Right (IPR) conferring its owner the right to prevent others from using an invention within a given territory for a limited period of time, usually 20 years.

Patent Cooperation Treaty (PCT): International treaty dated 19 June 1970 and administered by **WIPO**. It provides the possibility to seek patent protection in a large number of countries by filing a single international application (**PCT** application).

Patent pooling: Agreement between two or more patent owners in order to **Cross-licence** patents relating to a particular technology.

Patent thickets: Overlapping patents relating to a particular technology.

Patent troll: Patent owner who does not intend to exploit a patent but who enforces his patent rights against purported infringers.

Patentability: Substantive requirements that an invention must meet to be patentable.

Pending application: Application which has not been abandoned or withdrawn and on which no decision as to refusal or grant has been taken yet.

Person having ordinary skill in the art (PHOSITA): Legal fiction used in US patent law in order to assess whether a claimed invention is obvious or not. See **Person skilled in the art**.

Person skilled in the art: Legal fiction used in European patent law in order to assess whether a claimed invention shall be considered as involving an inventive step. This person should be presumed to be an ordinary practitioner aware of what was common general knowledge in the art at the relevant date and to have had access to everything in the state of the art.

Pharmacogenomics: Study of how an individual's genetic make-up affects his or her response to drugs and thus leading to efficiency by the personalisation of drug treatments.

Plant patents: In US patent law, exclusive rights granted to anyone who invents or discovers and asexually reproduces any distinct and new variety of plant.

Prior art: Item of the State of the art taken into consideration in deciding whether the invention to which the application relates is new and involves an inventive step.

Priority date: Date of filing of a first patent application in a State party to the **Paris Convention for the Protection of Industrial Property**. The applicant is entitled to a **right of priority** starting from this date.

Prisoner's dilemma: The prisoner's dilemma is a type of non-zero-sum game (game in the sense of Game Theory). In this game, as in many others, it is assumed that each individual player ('prisoner') is trying to maximise his own advantage, without concern for the well-being of the other player.

Reach-through claims: Claims which constitute an attempt to extend the scope of protection beyond the subject-matter actually disclosed in the patent application to products still to be identified through the use of the claimed invention.

Registered Design: Exclusive right granted to the author of the outward appearance of a product or part of it which results from the lines, contours, colour, shape, texture, materials and its ornamentation.

Request for examination: Statement filed by the patent applicant, within specific time limits, asking the relevant patent office to assess whether the claimed invention meets the patentability requirements.

Research exemption (or safe harbour exemption): Limited exception to the rights conferred by a patent allowing third parties to perform purely research-based activities with no commercial implications with regard to the subject matter of a patented invention.

Research tools: Range of resources that scientists use in their laboratories, which have no immediate therapeutic or diagnostic value. Examples include cell lines, monoclonal antibodies, reagents, laboratory equipment and machines, databases and computer software e.g. 'rival-in-use' (e.g. receptor, specific to particular therapeutic approach to disease) and 'not rival-in-use' (e.g. PCR, microarrays etc.).

Renewal fees: Amount payable to patent offices on a yearly basis with regard to a patent application or a patent.

Right of priority: Right having the effect that the **priority date** will count as the date of filing of the subsequent patent applications filed during the twelve months following the **priority date** in respect of the same invention.

Royalty stacking: Situation caused by the existence of a plurality of patents relating to a particular technology, which requires the payment of licence fees to many patent owners.

Search report: Document mentioning the available **prior art** which may be taken into consideration in deciding whether the invention to which the patent application relates is new and involves an inventive step. See also **Extended European search report**.

State of the art: Everything made available to the public by means of a written or oral description, by use, or in any other way, before the date of filing of the patent application.

Submarine patents: In the US patent system, patent applications kept secret for a long period and not published until grant.

Substantive examination: Examination conducted by a patent examiner to determine whether to grant a **patent** or refuse a **patent application**.

Trade Mark: Exclusive right conferred to the owner of a distinctive sign, used to differentiate between identical or similar goods and services offered by different producers or services providers.

Trade-Related Aspects of Intellectual Property Rights (TRIPS): Annex to the World Trade Organisation (WTO) agreement, establishing a set of minimum standards for the protection of **IPR**.

Trade Secret: Undisclosed Information which is not generally known or accessible, has commercial value because it is secret, and has been subject to reasonable steps to keep it secret.

Traditional or Indigenous Knowledge (TK): Cumulative body of know-how, information, practices, representations and skills of a local community associated to its cultural heritage.

'Tragedy of the Anti-Commons': Condition, in contrast to the 'Tragedy of the Commons' (overused resources like clean water, healthy forests, fresh air), wherein many **IPR** owners have to grant permission before a resource can be used, thus resulting in chronic underuse and the stifling of innovation.

Transnational Corporations (TNCs): Also multinational corporation (MNC) or multinational enterprise (MNE) or multinational organization (MNO), a corporation or enterprise that manages production establishments or delivers services in at least two countries.

United Nations Educational, Scientific and Cultural Organization (UNESCO): Specialized agency of the United Nations established in 1945. It promotes international co-operation in the fields of education, science, culture and communication.

United States Patent and Trademark Office (USPTO): Federal agency in the US Department of Commerce. Its major functions are the examination and grant of patents and the examination and registration of trademarks.

Utility model: IPR, sometimes known as a 'petty patent', available in some countries (e.g. Japan and Germany) and often sought for innovations of a rather incremental character which may not meet the **patentability** criteria.

World Bank Group: Group of five international organizations responsible for providing finance and advice to developing countries for the purposes of economic development and eliminating poverty. The Bank came into formal existence on 27 December 1945 following international ratification of the Bretton Woods agreements, where the United Nations Monetary and Financial Conference that led to their establishment took place. (see also **Bretton Woods system**).

World Intellectual Property Organization (WIPO): Specialized agency of the United Nations, responsible for the administration of various international treaties dealing with different aspects of intellectual property protection, such as the **Patent Cooperation Treaty (PCT)** and the **International Patent Classification system (IPC)**.

World Trade Organisation (WTO): International organisation dealing with the rules of trade between nations. It is responsible for the administration of the **TRIPS** agreement.

ACRONYMS

A2K: Access to Knowledge
AC: Administrative Council (EPO)
AFTA: ASEAN Free Trade Area
AIPLA: American Intellectual Property Law Association
AIPPI: International Association for the Protection of Intellectual Property
(FR: Association Internationale pour la Protection de la Propriété Intellectuelle)
AMEX: American Stock Exchange
APEC: Asia-Pacific economic Cooperation
ARIPO: African Regional Intellectual Property Organization (formerly ESARIPO)
ASEAN: Association of Southeast Asian Nations
BGH: Bundesgerichtshof (German Supreme Court)
BIRPI: United International Bureaus for the Protection of Intellectual Property
(FR: Bureaux Internationaux Réunis pour la Protection de la Propriété Intellectuelle)
BRCA1: Breast Cancer 1, early onset human gene
BRICs: Brazil, Russia, India, China
CACM: Central American Common Market
CAFC: Court of Appeals for the Federal Circuit
CARICOM: Caribbean Community and Common Market
CBD: Convention on Biological Diversity
CEO: Chief Executive Officer
CESAGen: Centre for Economic and Social Aspects of Genomics (ESRC)
CESCR: Committee on Economic, Social and Cultural Rights
CHR: Commission on Human Rights
CII: Computer-Implemented Inventions
CSO: Civil Society Organisation
CSR: Corporate Social Responsibility
DALY: Disability-Adjusted Life Year
DG: Directorate General (EC)
DKPTO: Danish Patent and Trademark Office
DOI: Digital Opportunity Index
DRM: Digital Rights Management
DRSC: Accounting Standards Committee of Germany
(Deutsches Rechnungslegungs Standards Committee e.V.)
DTI: Department of Trade and Industry (UK)
EC: European Commission
ECJ: European Court of Justice
ECOSOC: Economic and Social Council (UN)
EGA: European Generic medicines Association
EICTA: European Information and Communications Technology Industry Association
EIT: European Institute of Technology
EPC: European Patent Convention
EPI: European Patent Institute (Institute of Professional Representatives before the EPO)
EPJ: European Patent Judiciary
EPLA: European Patent Litigation Agreement
EPO: European Patent Office or Organisation
ESBA: European Small Business Alliance
ESRC: Economic and Social Research Council
ETSI: European Telecommunications Standards Institute
EU: European Union
EUCD: EU Copyright Directive
FAO: (UN) Food and Agriculture Organisation
FASB: Financial Accounting Standards Board (US)
FFII: Foundation for a Free Information Infrastructure
FOSS: Free and Open Source Software (see OSS)
FSA: Financial Services Authority (UK)
FTA: Free Trade Area or Agreement
FTAA: Free Trade Area of the Americas
FTC: Federal Trade Commission (US)
GAAP: Generally Accepted Accounting Principles (US)
GATT: General Agreement on Tariffs and Trade
GCI: Global Competitive Index
GDP: Gross Domestic Product
GERD: Gross domestic expenditure on research
GI: Geographical Indications
GIF: Graphics Interchange Format
GMO: Genetically Modified Organism (also GM crops, plants, animals)
GRUR: Gewerblicher Rechtsschutz und Urheberrecht
(Journal directed to the protection of intellectual property)
HTTP: Hypertext Transfer Protocol
IB: International Bureau (WIPO)
ICC: International Criminal Court
ICT: Information and Communications Technology
(see IS and IT)
ICTSD: International Centre for Trade and Sustainable Development
IDC: Innovative Developing Countries
IFRS: International Financial Reporting Standards
IGC: Intergovernmental Committee on IP and Genetic Resources (WIPO)
IP: Intellectual Property
IPAC: IP Advisory Committee (UK Parliament)
IPEA: International Preliminary Examination Authority (WIPO)
IPR: Intellectual Property Rights
IPRP: International Preliminary Report on Patentability (PCT)
IRC: Innovation Relay Centres (EC)
IS: Information Services
ISA: International Search Authority (WIPO)
IT: Information Technology
JEDEC: Joint Electron Device Engineering Council
JPEG: Joint Photographic Experts Group
JPO: Japan Patent Office
KIPO: Korean Intellectual Property Office
LDC: Less or Least Developed Country
LES: Licensing Executives Society
LSE: London Stock Exchange
M&A: Mergers and Acquisitions
MARID: MTA Authorization Records in DNS
MDG: Millennium Development Goals (UN)
MEP: Member of European Parliament
MERCOSUR: Common Market of the South [America] (Sp: Mercado Común del Sur)
MNC: Multinational Corporation or Company
(see also **MNE:** multinational enterprise, **TNC:** transnational corporation, **MNO:** multinational organisation)
MOU: Memorandum of Understanding
MPEG: Motion Pictures Experts Group
NBIC: Nano-, Bio-, Information and Cognitive technologies
NGO: Non-governmental organisation
NPE: Non-Patenting Entity (see PLEC)
NPO: National Patent Office
OA: Open Access
OAPI: African IP Association (Fr: Organisation Africaine de la Propriété Intellectuelle)
OBRA: Omnibus Budget Reconciliation Act (US)
OECD: Organisation for Economic Co-operation and Development
OEPM: Spanish Patent and Trademark Office
(ES: Oficina Española de Patentes y Marcas)
OFF: Office of First Filing
OPEC: Organisation of Petroleum Exporting Countries
OSF: Office of Second Filing
OSGi: Open Services Gateway initiative
OSS: Open Source Software
P2P: Peer to Peer
PCC: Patents County Court (UK)
PCDA: Provisional Committee for the Development Agenda (WIPO)
PCT: Patent Cooperation Treaty
PEH: Patent Examination Highway (JP, CN, KR)
PHOSITA: Person Having Ordinary Skill In The Art
PLEC: Patent Licensing and Enforcement Company
(an NPE)
PLT: Patent Law Treaty
PPH: Patent Prosecution Highway (JP, US)
PPP: Purchasing Power Parity
R&D: Research and Development
RSS: Rich Site Summary, or Really Simple Syndication: a form of XML used in the delivery of blog feeds
RTA: Regional Trade Agreement
S&P: Standard & Poor's
SACU: Southern African Customs Union
SCP: Standing Committee on Law of Patents (WIPO)
SDRAM: Synchronous Dynamic Random Access Memory
SEC: Securities and Exchange Commission (US)
SIPO: State Intellectual Property Organisation (China)
SMEs: Small- and medium-sized enterprises
SPLT: Substantive Patent Law Treaty
STI: Science, Technology and Innovation
TAFTA: Trans-Atlantic Free Trade Agreement
TK: Traditional Knowledge
TRIPS Agreement: Agreement on trade-related aspects of intellectual property rights
TTBER: Technology Transfer Block Exemption Regulation (EC)
TTO: Technology Transfer Office
UEAPME: European Association of Craft, Small and Medium-Sized Enterprises
[Fr: Union Européenne de l'Artisanat et des Petites et Moyennes Entreprises]
UN: United Nations
UNCTAD: United Nations Conference on Trade and Development
UNESCO: United Nations Educational, Scientific and Cultural Organization
UNICE: Union of Industrial and Employers' Confederations of Europe
[Fr: l'Union des Industries de la Communauté européenne]
[Note: Now known as BUSINESSEUROPE from 23.01.2007]
UPOV: International Union for the Protection of New Varieties of Plants
USPTO: United States Patent and Trademark Office
W3C: World Wide Web Consortium
W-CDMA: Wideband Code Division Multiple Access
WCT: WIPO Copyright Treaty
WHO: World Health Organization
WIPO: World Intellectual Property Organization
WPPT: WIPO Performances and Phonogram Treaty
WTO: World Trade Organization
WWII: World War II

BIBLIOGRAPHY & REFERENCES

We apologise to all whose work we missed or could not cite because of space constraints.
All cited URLs were active on 2 March 2007

EXECUTIVE SUMMARY

1 Committee on Prospering in the Global Economy of the 21st Century: An Agenda for American Science and Technology, National Academy of Sciences, National Academy of Engineering, Institute of Medicine (2007) *Rising Above The Gathering Storm: Energizing and Employing America for a Brighter Economic Future*. Washington DC: National Academies Press.
2 Tony Blair Interview. *New Scientist*, 4 November 2006.
3 The metaphor of dwarves standing on the shoulders of giants is first recorded in the twelfth century and attributed to Bernard of Chartres. It was also famously used by the seventeenth-century scientist Isaac Newton. The attribution to Bernard is due to John of Salisbury. In 1159, John wrote in his Metalogicon: "Bernard of Chartres used to say that we are like dwarfs on the shoulders of giants, so that we can see more than they, and things at a greater distance, not by virtue of any sharpness on sight on our part, or any physical distinction, but because we are carried high and raised up by their giant size."

EVOLUTION OF THE SYSTEM

1 EPO Interview.
2 **www.wipo.int/treaties/en/ip/paris/**
3 **www.wipo.int/treaties/en/registration/pct/**
4 UNCTAD-ICTSD Project on IPRs and Sustainable Development (2005) *Resource Book on TRIPS and Development*, Cambridge University Press.
5 Confirmed by the State Street Bank & Trust Company v Signature Financial Group, Inc. decision by the US Supreme Court made in 1998, based on a patent granted in 1993.
6 **http://www.archives.gov/national-archives-experience/charters/constitution.html**
7 EPO Interview.
8 Kenneth Cukier, "A Market for Ideas," *The Economist*, 21 October 2005, **http://www.cfo.com/article.cfm/5075748/c_2984312/?f=archives**
9 MA Heller and R Eisenberg: "Can Patents Deter Innovation? The Anticommons in Biomedical Research," *Science* 280, p 5364 (1 May 1998).
10 Trevor Cook, *A European Perspective as to the Extent to which Experimental Use, and Certain Other, Defences to Patent Infringement, apply to Differing Types of Research*. A Report for the Intellectual Property Institute, March 2006.
11 Carlos Morel, et. al. *Health Innovation in Developing Countries to Address Diseases of the Poor*. Refer to **www.biodevelopments.org/innovation/ist1.pdf** Volume 1, Number 1, 2005 p 1-15.
12 For example, **www.sarpn.org.za/CountryPovertyPapers/SouthAfrica/april2002/berger/berger.pdf**
13 World Bank (2004) *Poor People's Knowledge: Promoting Intellectual Property in Developing Countries*, ed. Finger and Schuler, Oxford University Press.
14 WIPO Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore (IGC) **www.wipo.int/tk/en/**
15 Ermias Tekeste Biadgleng, *IP Rights under Investment Agreements: The TRIPS-Plus Implications for Enforcement and Protection of Public Interest*, South Centre Research Paper No. 8, August 2006, **http://papers.ssrn.com/sol3/papers.cfm?abstract_id=943013**
16 **www.grain.org/rights/tripsplus.cfm**
17 'Edinburgh' patent limited after European Patent Office opposition hearing, **http://www.european-patent-office.org/news/pressrel/2002_07_24_e.htm**
18 Technical Board of Appeal restricts 'Oncomouse' patent, **http://www.european-patent-office.org/news/pressrel/2004_07_06_e.htm**
19 European patent on mutations in breast and ovarian cancer susceptibility gene amended after public hearing, **http://www.european-patent-office.org/news/pressrel/2005_01_25_e.htm**
20 "Good policies, not patents, are the real cure for Aids patients," *The Statesman*, 28 November 2006, **http://www.thestatesmanonline.com/pages/news_detail.php?newsid=1544&section=7**
21 EPO Interview.
22 EPO Interview.
23 EPO Interview.
24 CBI response to the Gowers review on intellectual property, see in particular p 8, **http://www.hm-treasury.gov.uk/media/55F/05/CBI_201_53kb.pdf**
25 IDEI report, *Objectives and Incentives at the European Patent Office*, December 2006, **http://www.idei.fr/doc/by/seabright/report_epo.pdf**
26 **http://www.uspto.gov/web/offices/com/annual/2006/2006annualreport.pdf**, see also **www.techlawjournal.com/topstories/2004/20040202.asp**
27 *Policy Options for the European Patent System*, Workshop, European Parliament, 9 November, 2006.
28 Dietmar Harhoff (2006), *Intellectual property rights in Europe – where do we stand and where should we go?* Globalisation Challenges for Europe and Finland organised by the Secretariat of the Economic Council, **http://www.vnk.fi/hankkeet/talousneuvosto/tyo-kokoukset/globalisaatioselvitys-9-2006/artikkelit/Harhoff_06-09-20.pdf**
29 F Lévêque and Y Ménière (2006) "Academic response to the European Commission's Questionnaire on the patent system in Europe: An economic approach," *World Patent Information* 28: p 305-311.
30 EPO Interview.
31 Dean Baker (2004) "Financing Drug Research: What are the issues?" *Center for Economic and Policy Research Issue Brief*.

DRIVING FORCES

1 D Yergin and J Stanislaw (1999) *The Commanding Heights*, Touchstone Books, p 13.
2 RD Putnam (1993) *Making Democracy Work: Civic Traditions in Modern Italy*, Princeton University Press.
3 Thomas Carothers in "Think Again: Civil Society," *Foreign Policy*, Winter 1999-2000.
4 "The World's View of Multinationals," *The Economist*, 27 January 2000.
5 J Bakan (2004) *The Corporation*, Constable, p 25.
6 J Stiglitz (2006) *Making Globalization Work*, Allen Lane Penguin.
7 J Bakan (2004) *The Corporation*, Constable, p 41.
8 World Bank, *Defining Civil Society*, **http://go.worldbank.org/4CE7W046K0**
9 *Categorizing NGOs: World Bank Criteria*, **http://docs.lib.duke.edu/igo/guides/ngo/define.htm**
10 World Bank, *NGOs and Civil Society*, archived at **http://snipurl.com/WorldBankNGOs1 and http://snipurl.com/WorldBankCivil**
11 World Bank, *Defining Civil Society*, **http://go.worldbank.org/4CE7W046K0**
12 Yearbook of International Organizations 2004, **www.uia.org/statistics/pub.php**
13 Montreal International Forum (FIM), *Milestones in the History of NGOs*, **www.fimcivilsociety.org/english/MilestonesInTheHistoryOfNGOs.htm**
14 Marlies Glasius, Mary Kaldor and Helmut Anheier (eds, 2005) *Global Civil Society 2005/6*, Sage Publishing.
15 Amitai Etzioni (2001) *Political Unification Revisited: On Building Supranational Communities*, Lanham: Lexington Books.
16 EPO Interview.
17 **www.astp.net**
18 **http://www.tynax.com/ttx1/default.asp**
19 **www.sbh-online.de/cgi-win/techboerse.exe?Start**
20 **www.ip-auction.eu**
21 Stephan Lipfert and Guido von Scheffer, "Europe's first patent value fund," *Intellectual Asset Management* December/January 2006.
22 **www.oceantomo.com**
23 BBC News website, WTO/World Bank, **http://news.bbc.co.uk/1/hi/business/4547866.stm#**
24 World Bank (2000), *Does More International Trade Openness Worsen Inequality?* Briefing Paper no. 3.
25 "The Great Leveller," *FT Magazine*, July 22/23 2006, p 14.
26 TL Friedman (2005) *The World is Flat*, Penguin.
27 **http://news.bbc.co.uk/1/hi/in_depth/business/2004/world_trade/default.stm#** : Trade and the Poor.
28 World Bank (2000), *Does More International Trade Openness Worsen Inequality?* Briefing Paper no. 3, p 2.
29 J Nye (2004) *Soft Power: The Means to Success in World Politics*, Harvard University Press.
30 Paul S Peercy (2000), "The Drive to Miniaturization," *Nature* 406, p 1023–1026.
31 James Canton (2004), "Designing The Future, NBIC Technologies and Human Performance Enhancement," *Annals of the New York Academy of Sciences*, 1013: p 186-198.
32 R Kurzweil (2005) *The Singularity is Near: When Humans Transcend Biology*, Penguin.
33 Edward Tenner (1996), *Why Things Bite Back: Technology and the Revenge of Unintended Consequences*, Random House.
34 "Shopping for Humans," *The Guardian*, 29 March 2001, **www.guardian.co.uk/Archive/Article/0,4273,4161345,00.html**
35 Hararay (1994), quoted by Laymert Garcia Dos Santos in *High-tech plundering, biodiversity and cultural erosion: The case of Brazil*, **www.ces.uc.pt/emancipa/research/en/ft/biosocio.html**
36 **http://www.itu.int/osg/spu/publications/internetofthings/**
37 T Friedman (2000) *The Lexus and the Olive Tree*, Harper Collins.
38 Powell and DiMaggio (1991) *The new institutionalism in organizational analysis*. University of Chicago Press; M Gell-Man (1994) *The Quark and the Jaguar: Adventures in the Simple and the Complex*, WH Freeman and Co.
39 F Westley (2003) interview in Wilkinson et al, "Riskworld 2020," *Journal of Risk Research*, vol. 6:4-6, p 568-575.
40 H Wainwright, O Beyes et al. (2007) *Networked Politics: Rethinking political organisations in an age of movements and networks*. Transnational Institute, Amsterdam. Refer to **www.tni.org**
41 S Kauffman (1995) *At Home in the Universe: The Search for the Laws of Self-Organisation and Complexity*, Oxford University Press.
42 Daniel Gilbert (2006) *Stumbling on Happiness*. HarperCollinsPublishers.
43 Martin Heidegger and Rudolf Augstein (1966) **http://wfgw.diemorgengab.at/tzn200301.htm**
44 Ulrich Beck (1992) *Risk Society: Towards a New Modernity*, Sage Publications.
45 Paolo Virilio and John Armitage (2000) **www.ctheory.net/articles.aspx?id=132**
46 L Festinger (1957) *A Theory of Cognitive Dissonance*, Stanford University Press.
47 E Kubler-Ross (1973) *On Death and Dying*, Routledge.
48 Intergovernmental Panel on Climate Change, **http://www.ipcc.ch/**
49 Thomas Homer-Dixon (2000) *The Ingenuity Gap*, Knopf, p53-54.
50 Lance Gunderson, CS Holling (eds. 2001), *Panarchy*, Island Press.
51 *Official Journal of the EPO*, 8-9/1999, p 545-553.
52 OECD (2003) *Emerging risks in the 21st century*; Swiss Re (2004) *The risk landscape of the Future*.
53 Wilkinson et al "RiskWorld 2020," *Journal of Risk Research*, 6: p 4-6, July 2003.
54 Donella Meadows, Dennis Meadows, Jørgen Randers, William Behrens III (1972) *The Limits to Growth*, Universe Books.
55 Nicholas Stern (2006) *The Economics of Climate Change*, Cabinet Office/HM Treasury, Cambridge University Press, **http://snipurl.com/1fp8**
56 **http://europa.eu/press_room/presspacks/energy/index_en.htm**
57 **www.maweb.org/en/index.aspx**
58 War Over Water Predicted By United Nations Environment Official, **http://www.sciencedaily.com/releases/1999/01/990106075344.htm**, see also: UNEP Helmsman Töpfer Addresses Environmental Challenges, *Environmental Journal of Science and Technology*, 1 January, 1999 / Volume 33, Issue 1 / p 18-23
59 Phillips McDougall, *Seed Industry Consolidation*, July 2005. Unpublished report. Phillips McDougall estimates the value of the worldwide commercial seed market to be US$19,000 million a quarter of which being GM seed.
60 José Esquinas-Alcázar (2005) "Protecting crop genetic diversity for food security," *Nature Review Genetics*, Vol. 6, p 946-953.
61 Global Seed Industry Concentration – 2005, ETC group *Communiqué*, Issue 90, September/October 2005. **www.mindfully.org/Farm/2005/Global-Seed-Industry6sep05.htm**
62 Carl-Christian Schmidt "Fish crisis: a problem of scale," *OECD Observer*, August 2002.
63 Edward Wilson (2006), *The Creation: An appeal to save life on earth*, WW Norton.
64 "Bad bugs, no drugs," *IDSA*, **http://www.idsociety.org/pa/IDSA_Paper4_final_web.pdf**
65 W Wayt Gibbs "Software's Chronic Crisis," *Scientific American*, September 1994.
66 Charles Perrow (1999), *Normal Accidents: Living with High Risk Technologies*, Princeton University Press.
67 Human Security Centre (2006) *Human Security Report 2005, War and Peace in the 21st Century*. Oxford University Press. Refer to **www.humansecurityreport.info/**
68 Leigh Hochberg et al. (2006), "Neuronal ensemble control of prosthetic devices by a human with tetraplegia," *Nature* 442, p 164-171.
69 Legal status of genetics: **www.bionetonline.org/English/Content/db_leg2.htm#genes**
70 "Choosing Babies," *MIT Technology Review*, March 2007, **http://www.technologyreview.com/Biotech/18303/**
71 Giuseppe Testa and John Harris, "Ethical Aspects of ES Cell-Derived Gametes," *Science*, 17 September 2004: Vol. 305. no. 5691, p 1719, DOI: 10.1126/science.1103083.
72 P David (1998) "CLIO and the economic organisation of science," *AEA Papers and Proceedings*, Vol. 88, no. 2, p 15-21; P David (2006) *Using IPR to expand the research commons for Science*, Presentation for the First Annual Conference of the EPIP, 7-8 September 2006. **http://www.inno-tec.de/epip/submissions/Paul%20David_Commons_Presentation.pdf**
73 J Battelle (2005) *The search: how Google and its rivals rewrote the rules of business and transformed our culture*, Nicholas Brearley Publishing.
74 *The World Information Society Report 2006*, **www.itu.int/osg/spu/publications/worldinformationsociety/2006/report.html**
75 E von Hippel and G von Krogh (2003) "Open Source Software and the 'Private-Collective' Innovation Model," *Organisation Science*, Vol 14, no. 2.
76 M Gladwell (2000) *The Tipping Point: How Little Things Can Make a Big Difference*, Little Brown.
77 Declan Butler (2001) "Bioinformatics: Data's future shock," *Nature*, 413 Issue 6851; Steve Buckingham (2004), *Nature* 428, p 774-777.
78 James Bessen, Eric Maskin (1999, revised 2006) *Sequential Innovation, Patents and Imitation*, **www.sss.ias.edu/publications/papers/econpaper25.pdf**
79 Carl Sapiro (2001) *Navigating the patent thicket*, **http://faculty.haas.berkeley.edu/shapiro/thicket.pdf**
80 W Bibel (ed, 2004) *Converging Technologies and the Natural, Social and Cultural World*, Special Interest Group Report for the European Commission; *Converging technologies for improving human performance*, National Science Foundation, June 2002; PS Anton, R Silberglitt, J Schneider

(2001) *The Global Technology Revolution*, National Intelligence Council.
81 European Commission (1999) *Strategic Dimensions of Intellectual Property Rights*, **http://ec.europa.eu/research/era/pdf/ipr-expertgroupreport.pdf**
82 Y Benkler cited in "The economics of sharing," *The Economist*, 3 February 2005, **http://www.economist.com/finance/displayStory.cfm?story_id=3623762**
83 A Stille (2002) *The Future of the Past: How the Information Age Threatens to Destroy our Cultural Heritage*, Picador/Pan MacMillan.
84 JM Finger and P Schuler (eds, 2004) *Poor People's Knowledge: Promoting Intellectual Property in Developing Countries*, Oxford University Press.
85 S Weber (2004) *The Success of Open Source*, Harvard University Press.
86 Biological Open Source, see **www.bios.net**
87 "The tee-shirts have taken over," *Managing Intellectual Property*, November 2006.
88 Jonathan Schwartz quoted in "The five founding principles that drive innovation," *Financial Times*, 13 September 2006.
89 **www.responsible-partnering.org**
90 *Budapest Open Access Initiative* **www.soros.org/openaccess/index.shtml**

KALEIDOSCOPE SOCIETY

1 Robert Putnam, (2001) *Bowling Alone: The Collapse and Revival of American Community*, Simon & Schuster.
2 **http://www.trendwatching.com/briefing/**
3 **http://www.citymayors.com/development/metropolis_congress.html**
4 *Differences within countries*, **www.gapminder.org**
5 *Regional income distribution*, **www.gapminder.org**
6 *World Education Chart, 2004*, **http://www.gapminder.org/Projects/WorldEducationChart2004/school_LEX_2004.pdf**
7 *Understanding Adaptation to Climate Change in Developing Countries*, International Institute for sustainable development (IISD), **http://www.iisd.org/climate/south/background_va.asp**
8 R Inglehart and WE Baker (2000) "Modernization, Globalization and the Persistence of Tradition: Empirical Evidence from 65 Societies." *American Sociological Review*, vol. 65, p 19-55. **www.worldvaluessurvey.org**
9 *MIPT Terrorism Knowledge Base (TKB)*, **http://www.tkb.org/**
10 ESRC Society Today, *Global Migration*, **http://www.esrc.ac.uk/ESRCInfoCentre/facts/international/migration.aspx?ComponentId=15051&SourcePageId=16287**
11 2006 World Trade Report, *Exploring the links between subsidies, trade and the WTO*, **http://www.wto.org/English/res_e/booksp_e/anrep_e/world_trade_report06_e.pdf**
12 **http://www.un.org/esa/population/publications/ageing/Graph.pdf**
13 **http://www.china-profile.com/data/ani_ceu_pop.htm#**
14 "The labour shortage time bomb," *Management-issues*, 2004, **http://www.management-issues.com/display_page.asp?section=research&id=1084**
15 K van der Veer (2003) *The Future of Western Societies: Multicultural Identity or Extreme Nationalism?* London, Penguin.
16 Richard Jackson & Neil Howe, *The Demographics and Economics of Retirement Policy in China: the graying of the middle kingdom*, 2004, Center for Strategic and International Studies, Prudential Foundation.
17 *World HIV Chart*, **http://www.gapminder.org/Projects/WorldAidsChart/World_HIV_Chart_2004.pdf**

GREY SCENARIO: MARKET RULES

1 *Interviews for the Future*, EPO (2006), p 203.
2 **www.ftc.gov/os/2003/10/innovationrptsummary.pdf**
3 Mario Monti (European Commissioner for Competition Policy), *The New EU Policy on Technology Transfer Agreements*, École des Mines Paris (FR), 16 January 2004, **http://europa.eu/rapid/pressReleasesAction.do?reference=SPEECH/04/19**
4 *Interviews for the Future*, EPO (2006), p 77-78.
5 **www.brandfinance.com/docs/invisible_business.asp**
6 Dr Malte Köllner, Triangle Venture Capital Group, *A Venture Capital Perspective on Patent Valuation and new Regulations*, OECD Conference on Intellectual Property Valuation and Exploitation in Berlin, June 2005. **http://academy.epo.org/schedule/2005/e02/session%201/koellner.pdf**
7 **http://academy.epo.org/schedule/2005/e02/background_report.pdf**
8 **www.wipo.int/patent/meetings/2004/statistics_workshop/en/presentations/statistics_workshop_gambardella.pdf** (p 4).
9 **www.leyton.org/diary/2006/10/23/backfiring-adverts**
10 **http://ec.europa.eu/internal_market/indprop/docs/patent/studies/patentstudy-report_en.pdf** (p 76).
11 *Interviews for the Future*, EPO (2006), p 393.
12 *Interviews for the Future*, EPO (2006), p 120.
13 For example, **http://judiciary.house.gov/media/pdfs/printers/109th/28201.pdf**
14 *Patents And Innovation: Trends And Policy Challenges*, OECD 2004 **www.oecd.org/dataoecd/48/12/24508541.pdf**
15 *Interviews for the Future*, EPO (2006), p 147.
16 **www.trilateral.net/tsr/tsr_2005/worldwide_activity.pdf**
17 *Interviews for the Future*, EPO (2006), p 64.
18 WIPO, *Program Activities, Small and Medium-Sized Enterprises (SMEs) Division* **www.wipo.int/sme/en/about_sme.html**
19 "Intervention of Professor Alain Pompidou, President of the European Patent Office, at the public hearing on future patent policy in Europe, Brussels, 12 July 2006," point 5. **www.european-patent-office.org/news/pressrel/2006_07_12_e.htm**
20 CJA Consultants (2003) *Patent litigation Insurance, A Study For The European Commission On Possible Insurance Schemes Against Patent Litigation Risks*, p 43 **http://ec.europa.eu/internal_market/indprop/docs/patent/studies/litigation_en.pdf**
21 EPO Public Hearings, *Small and medium-sized enterprises, Prague, 25 October 2004*, p 4-8 **http://hearings.european-patent-office.org/_pdf/brochure_en.pdf**
22 *Interviews for the Future*, EPO (2006), p 182.
23 Dr Werner Fröhling (Volvo), *Practical experiences regarding the evaluation of medium-sized patent portfolios*, OECD Conference on Intellectual Property Valuation and Exploitation, Berlin, July 2005 **http://academy.epo.org/schedule/2005/e02/session%205a/froehling.pdf**
24 **http://academy.epo.org/schedule/2005/e02/background_report.pdf**
25 **www.ipb-ag.de/03_1_050913_The_value_of_intangible_assets_in_the_knowledge_economy.pdf**
26 **www.oecd.org/dataoecd/62/52/37031481.pdf**
27 *Interviews for the Future*, EPO (2006), p 316.
28 *Intellectual Property As An Economic Asset: Key Issues in Valuation and Exploitation; Background and issues*, paper for OECD Conference on Intellectual Property Valuation and Exploitation, Berlin, 30 June and 1 July 2005, paragraph 2 **http://academy.epo.org/schedule/2005/e02/background_report.pdf**
29 Kevin G Rivette and David Kline (2000) *Rembrandts in the Attic: Unlocking the Hidden Value of Patents*, Harvard Business School Press.
30 **www.solvay.edu/EN/Research/Bernheim/documents/WP05-008ESapasalieBvanPottelsberghe.pdf** (p 3).
31 Guido von Scheffer, (IP Bewertungs AG) and Dr Martin Zieger (KPMG), *Methods for Patent Valuation*, paper to OECD Conference on Intellectual Property Valuation and Exploitation, Berlin, 1 July 2005 **http://academy.epo.org/schedule/2005/e02/session%205a/zieger_scheffer.pdf**
32 For example, **www.altitudecapitalpartners.com**
33 *Interviews for the Future*, EPO (2006), p 336.
34 **www.sipo.gov.cn/sipo_English/gfxx/zyhd/200612/t20061206_123915.htm**
35 *Interviews for the Future*, EPO (2006), p 148.
36 *Interviews for the Future*, EPO (2006), p 209.
37 **www.uspto.gov/web/offices/ac/comp/proc/srchexam/schexrfi.htm** for the tender offer; more detail at: **http://snipurl.com/USPTOoutsource**
38 **www.uspto.gov/main/homepagenews/bak2007feb07.htm**
39 Communication From The Commission To The European Council (Informal Meeting In Lahti – Finland, 20 October 2006) **http://snipurl.com/CI_lahti**
40 Legislative Initiatives in European Patent Law (EPO, 2006), *EPLA – European Patent Litigation Agreement* **http://patlaw-reform.european-patent-office.org/epla/**
41 "Agreement dated 17 October 2000 on the application of Article 65 EPC," *Official Journal of the EPO*, December 2001, p 549-553, **www.european-patent-office.org/epo/pubs/oj001/12_01**
42 *Interviews for the Future*, EPO (2006), p 383.
43 *Interviews for the Future*, EPO (2006), p 142.
44 EC Public Hearing, *Future Patent Policy in Europe, 12 July 2006*, **http://ec.europa.eu/internal_market/indprop/docs/patent/hearing/report_en.pdf** and **http://ec.europa.eu/internal_market/indprop/docs/patent/hearing/preliminary_findings_en.pdf** (p 15).
45 EPO Document CA164/06
46 US House of Representatives, 109th Congress, Bill H.R. 2795: *To amend title 35, United States Code, relating to the procurement, enforcement, and validity of patents.* **www.govtrack.us/data/us/bills.text/109/h/h2795.pdf**
47 US Senate, 109th Congress, Bill S. 3818; *To amend title 35, United States Code, to provide for patent reform.* **www.govtrack.us/data/us/bills.text/109/s/s3818.pdf**
48 "Developed Countries Speed Up Patent Harmonisation Outside WIPO," *Intellectual Property Watch*, **www.ip-watch.org/weblog/index.php?p=445&res=1600&print=0**
www.trilateral.net/meet_users/20061116/sourcefiles/pdf/aipla_user_needs.pdf
50 WIPO, *Substantive Patent Law Harmonization* **www.wipo.int/patent/law/en/harmonization.htm**
51 *Draft Substantive Patent Law Treaty*, WIPO Standing Committee On The Law Of Patents, Tenth Session, Geneva 10-14 May 2004, **www.wipo.int/edocs/mdocs/scp/en/scp_10/scp_10_2.pdf**
52 *Interviews for the Future*, EPO (2006), p 225.
53 **www.intellectual-property.gov.uk/ipac/pdf/enforce.pdf**
54 **www.infolaw.org/IP%20Marketplace.ppt** (see slides 41-44).
55 *Personal Tax Incentives for Renewables and Efficiency, Massachusetts – Alternative Energy and Energy Conservation Patent Exemption (Personal)* **http://snipurl.com/MA_energy_tax**
56 *Hawaii's Tax Incentives for Technology*, **www.hitechhawaii.com/taxincentives.asp**
57 *Tax incentive for inventors*, **www.tax.ok.gov/reports/2005-2006TaxExpRpt.pdf** (p 47).
58 *International R & D Tax Incentives* **www.investinamericasfuture.org/PDFs/021306incentives.pdf**
59 **www.techweb.com/wire/software/190302521**
60 C-539/03 (Roche/Primus) and C-4/03 (GAT/LuK)
61 **www.freshfields.com/publications/pdfs/2006/15856.pdf**
62 *Interviews for the Future*, EPO (2006), p 188, 189.
63 **http://judiciary.senate.gov/testimony.cfm?id=1911&wit_id=5366**
64 **www.iht.com/articles/2006/10/27/business/windows.php**
65 *Interviews for the Future*, EPO (2006), p 225.
66 **www.networkcomputing.com/1119/1119f1people_6.html**
67 **www.businessweek.com/1999/99_24/b3633192.htm**
68 Kevin G Rivette and David Kline (2000) *Rembrandts in the Attic: Unlocking the Hidden Value of Patents,* Harvard Business School Press, p 58.
69 **http://irvingwb.typepad.com/** (15 January 2007).
70 **www.ibm.com/ibm/licensing/patents/pledgedpatents.pdf**
71 **www.ibm.com/us/download/IBM_OSGi.pdf**
72 **www.internetnews.com/dev-news/article.php/3526356**
73 **www.ibm.com/ibm/governmentalprograms/ipbooklet.pdf**
74 **www.ibm.com/news/us/en/2006/01/2006_01_10.html**
75 **www.law.upenn.edu/blogs/polk/pqi/faq.html**
76 **http://irvingwb.typepad.com/blog/2006/02/patents_as_curr.html** (16 February 2006).
77 **http://news.zdnet.co.uk/itmanagement/0,1000000308,39183607,00.htm**
78 **http://hbswk.hbs.edu/archive/1230.html**
79 **www.iam-magazine.com/issues/Article.ashx?g=6c8bdbd8-a153-4f59-8e6f-feb4fc3f2ebc**
80 **www.lexmundi.com/images/lexmundi/PDF/Kroll_AtRiskValueofIP.pdf**
81 **www.aon.com/us/busi/industry_specialties/technology_telecom/intellectual_property.jsp**
82 **www.nera.com/FocusArea.asp?PA_ID=31&FA_ID=70**
83 **www.intelproplaw.com/Articles/files/Patent%20Insurance.pdf**
84 **http://ec.europa.eu/internal_market/indprop/docs/patent/studies/litigation_en.pdf**
85 **http://ec.europa.eu/internal_market/indprop/docs/patent/studies/pli_report_en.pdf**
86 G Von Schiffer (2006) "Creating a Market for Technology," EPO-OECD-UKPTO Conference "Patents – realising and securing value," London, 21 November 2006. **http://academy.epo.org/schedule/2006/ic09/II_1_scheffer/player.html**, slide 17.
87 **www.oceantomo.com/ot300.html**
88 K Cauthorn (2006) *Identifying and Managing Intellectual Property Risk and the Use of Insurance as a Risk Management Tool*, Fordham University School of Law Fourteenth Annual Conference, New York, 20-21 April 2006.
89 **www.european-patent-office.org/onlinelinks/f**
90 **www.shipp.gov.cn/en/gywm/gywm2.asp**
91 **www.sbh-online.de/cgi-win/techboerse.exe?Start**
92 **www.freepatentauction.com**
93 **www.qed-ip.com/licensing.htm**
94 **www.pl-x.com/index.shtml**
95 **www.thedeanslist.com**
96 **www.oceantomo.com/press/OT_300_Announcement_Release.pdf**
97 Fritz Machlup, *An Economic Review of the Patent System*, Study No.15 of Committee on Judiciary, Subcommittee on Patents, Trademarks, and Copyrights, 85th Congress, 2d Session (1958).
98 **www.tekno.dk/pdf/projekter/patent-system-STOA/background_document.pdf**, presentation by Roger Burt, IP Law Counsel, IBM Europe.
99 **http://judiciary.senate.gov/testimony.cfm?id=1911&wit_id=5366**
100 **http://ac.european-patent-office.org/strategy_debate/documentation/pdf/ec05073.pdf**
101 **www.jpo.go.jp/shiryou_e/toushin_e/kenkyukai_e/pdf/02-chapter1_1.pdf**
102 **http://academy.epo.org/pubs/_pdf/075_083.pdf**
103 Roland Berger (2005) *Study on the cost of patenting*, market research for the EPO, **www.european-patent-office.org/epo/new/cost_analysis_2005_study_en.pdf**
104 Prof Alain Pompidou, EPO President, Brussels, 12 July 2006, **www.european-patent-office.org/news/pressrel/2006_07_12_e.htm**
105 Ocean Tomo, LLC, **http://www.oceantomo.com/ot300.html**
106 **www.wipo.int/patent/meetings/2004/statistics_workshop/en/presentations/statistics_workshop_gambardella.pdf**, P Giur, M Mariani et al. (2007), *Inventors and Invention Processes in Europe*. Results from the PatVal-EU survey. Research Policy, forthcoming, p 4.
107 OECD Conference on Intellectual Property Valuation and Exploitation, Berlin (DE); Paper: *Intellectual property as an economic asset: Key Issues in Valuation and Exploitation; Background and issues*, 30 June and 01 July 2005 paragraph 2 **http://academy.epo.org/schedule/ 2005/e02/background_report.pdf**

108 **www.intellectual-property.gov.uk/ipac/pdf/enforce.pdf**
109 Stephan Lipfert, Director Patent Management; Guido von Scheffer, Director Business Affairs, EPO/OECD Conference *Patents: Realising and Securing Value*, London, 21 November 2006.
110 Ocean Tomo, LLC, **www.oceantomo.com/ot300.html**
111 **http://ac.european-patent-office.org/strategy_debate/documentation/pdf/ec05073.pdf www.jpo.go.jp/shiryou_e/toushin_e/kenkyukai_e/pdf/02-chapter1_1.pdf**
112 **www.european-patent-office.org/epo/new/cost_analysis_2005_study_en.pdf**

RED SCENARIO: WHOSE GAME?

1 Susan Strange (1970) "International economics and international relations: a case of mutual neglect," *International Affairs* Vol. 46 No. 2 (April), p 304-315. See also: "What Theory? The Theory in Mad Money," *CSGR Working Paper* No. 18/98, University of Warwick/Centre for the Study of Globalisation and Regionalisation.
2 EPO interview.
3 Susan Strange (1999) "The Westfailure System," *Review of International Studies* 25, 3 (July), p 345-354 on the failure of political systems to manage globalisation.
4 Map 099 from **www.worldmapper.org**; SASI Group (University of Sheffield) and Mark Newman (University of Michigan)
5 BBC News website, WTO/World Bank, **http://news.bbc.co.uk/1/hi/business/4547866.stm#**
6 "Weltkrieg um Wohlstand," *Der Spiegel* 37, 2006 (Maddison, IMF; BIP in Preisen von 1990 bzw. 2005, kaufkraftbereinigt, Prognose: Goldman Sachs, Westeuropa: Schätzung auf Basis der Goldman-Sachs-Prognose; BIP in Preisen von 2003).
7 *Mapping the Global Future*, report of the National Intelligence Council's 2020 Project, December 2004 **www.dni.gov/nic/NIC_globaltrend2020.html**
8 Ian Davis and Elizabeth Stephenson "Ten trends to watch in 2006," *McKinsey Quarterly*, January 2006.
9 Joseph Stiglitz (2002) *Globalisation and its discontents*, W W Norton & Co.
10 *Global Economic Prospects: Trade Regionalism and Development 2005*, World Bank Publications.
11 EPO interview.
12 EPO interview.
13 John Sulston "Free market must serve, not restrain, research," *Financial Times*, 30 November 2006. He states further: "When the EU or the US fails to get its way in trade negotiations they bypass the multilateral solution in favour of so called free trade areas... There are serious consequences to acquiescing in this... restraints on data sharing, which is the essential foundation of science... [and] commercial considerations impede the open access that is needed for fields to move ahead."
14 Wolfgang Munchau, "The good, the bad and the ugly scenarios," *Financial Times*, 2 January 2007.
15 Silberglitt et al. (2006) *Global Technology Revolution 2020*, Rand Corporation **www.rand.org/pubs/technical_reports/TR 303**
16 *idem*, p. 76.
17 EPO interview.
18 *Science, Technology and Industry Outlook 2006*, OECD STI directorate, **http://snipurl.com/OEC D_STI 1**
19 OECD, Main Science and Technology Indicators, 2006-I.
20 OECD, Main Science and Technology Indicators database, June 2006 and OECD, based on national sources.
21 Calestous Juma "Developing countries work around the 'technology divide'," *New Scientist*, 15 January 2005.
22 *Compendium of Patent Statistics 2006*, OECD-EPO, **www.oecd.org/dataoecd/5/19/37569377.pdf**
23 *Supra 18*, p 133.
24 *Supra 18*, p 138.
25 Professor Henk ten Have says further in his interview to EPO: "There is some knowledge, such as the genome, that needs to be preserved as the common property of humankind."
26 Finger and Schuler (eds 2004) *Poor People's Knowledge: Promoting Intellectual Property in Developing Countries*, World Bank and Oxford University Press.
27 WIPO Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore (the IGC) **www.wipo.int/tk/en**
28 See IGC Tenth Session (2006). **http://snipurl.com/IGC_Geneva**
29 During WIPO's meeting of the GRTKF committee in 2006, a joint statement was presented by the Indigenous Peoples Council on Biocolonialism (IPCB), Call of the Earth/Llamado de la Tierra (COE) and International Indian Treaty Council (IITC): *"Any attempt to develop IPR-based mechanisms to 'protect' IK actually poses much more threat to our knowledge, as a whole, than it can ever claim to prevent."* **http://snipurl.com/IPWatchIK**
30 CJ Forster (2006) *China's Secret Weapon: Science Policy and Global Power*, The Foreign Policy Centre, p 29-30.
31 *Supra 18*, p 155.
32 *Forum on Internationalisation of R&D*, Brussels, Belgium, 29-30 March 2005, OECD.
33 *"Foreign technological activity now aims to tap into local fields of expertise, and to provide a further source of new technology that can be utilised internationally in the other operation of the MNC"* "The globalisation of technology: what remains of the product cycle model?," *Cambridge Journal of Economics*, Vol. 19 No. 1, February 1995.
34 EPO interview.
35 See *Trilateral Statistical Report 2005* **www.trilateral.net/tsr/tsr_2005**
36 Slide presentation at the Council of Foreign Relations, New York, May 24 2005. **www.eastwestcenter.org/stored/pdfs/SR010.pdf**
37 *Scattering the seeds of innovation: The globalisation of research and development*. A white paper prepared for Scottish Development International, London 2004. **www.eastwestcenter.org/stored/pdfs/SR010.pdf**
38 OECD based on World Bank, World Development Indicators database, June 2006. Statlink: **http//dx.doi.org/10.1787/324047030044**
39 Prof Jerry Thursby (2006) *Here or There? A Survey of Factors in Multinational R&D Location*, Thursby and Thursby.
40 *Supra 18*, p 161.
41 *The UN Millennium Development Goals*, **www.un.org/millenniumgoals**
42 "Weltkrieg um Wohlstand," *Der Spiegel* 37, 2006; see "Kernschmelze" figure.
43 Quoted by Edward Luce and Krishna Guha "Democrats retreat from free-trade record," *Financial Times*, 2 November 2006.
44 Kyle Bagwell, Robert Staiger "A Theory of Managed Trade," *American Economic Review*, Vol. 80, No. 4 , p 779-795, September 1990: "As the volume of trade expands, the level of protection must rise in a cooperative equilibrium."
45 EPO interview.
46 *Supra 22*, Fig. 1.1.
47 The World Bank Report, supra 10, Chapter 5, identifies considerable differences between agreements signed by the EU and US, which is said to impose TRIPS-plus conditions.
48 William P Alford (1995) *To Steal A Book Is An Elegant Offense: Intellectual Property Law In Chinese Civilization*, Stanford University Press.
49 Fiona Harvey "Climate action consensus elusive," *Financial Times*, 30 October 2006.
50 Mure Dickie "China blames the west for global warming," *Financial Times*, 6 February 2007.
51 *Mapping the Global Future*, Report of the National Intelligence Council's 2020 Project (2004) (**www.foia.cia.gov/2020/2020.pdf** see in particular "New Caliphate" and "Pervasive Insecurity" scenarios).
52 *Supra 10*, p 49-51.
53 *Supra 10*, p 51: "Trade among these blocs is intensifying, becoming more diversified, and linked with a web of business ties across oceans that bind the world market together."
54 *Supra 10*, p 51.
55 Jo Johnson and Richard McGregor "Old grievances bedevil efforts to reach across the Himalayas," *Financial Times*, 20 November 2006; Guy de Jonquières "Asia's emerging giants have little in common," *Financial Times*, 29 November 2006.
56 "Hu reassures Africa on China's intent," *Financial Times*, 8 February 2007; Alan Beattie and Eoin Callan "China loans create 'new wave of Africa debt'," *Financial Times*, 7 December 2006.
57 Shanghai Cooperation Organization **www.fmprc.gov.cn/eng/topics/sco/t57970.htm**
58 In the *Aspiring Australia 2025* project of the Business Council of Australia (BCA, 2006), all scenarios revolve around China's development and alliances in the Asian-Pacific region.
59 David Pilling "Japan talks of 'strategic partnership' with China," *Financial Times*, 7 March 2006.
60 Yves Lacoste (2006) *Géopolitique – La longue histoire d'aujourd'hui*, Larousse (see p 165-186, "La Chine: une grande énigme géopolitique").
61 Quentin Peel and Bertrand Benoit "Interview with Angela Merkel," *Financial Times*, 2 January 2007.
62 *Der Spiegel* 37, 2006.
63 Matthias Wissmann "Vive l'union transatlantique!" *Le Monde*, 24 October 2006.
64 Bertrand Benoit in Berlin and Andy Bounds "Merkel's transatlantic plan gains ground," *Financial Times*, 26 January 2007.
65 Andy Bounds "EU to link labour standards to trade deals," *Financial Times*, 6 December 2006.
66 EPO interview.
67 Pedro Roffe et al (2006) *Negotiating Health – IP and Access to Medicines*, Earthscan.
68 EPO interview.
69 *A Practical Plan to Achieve the Millennium Development Goals*, **www.unmillenniumproject.org/reports/index_overview.htm**
70 C Juma, L Yee-Cheong (2005) *Innovation: Applying Knowledge in Development*, Task Force on Science: Technology and Innovation: Millennium Project.
71 A World Bank study (see C Wagner et al (2000) *Science & Technology Collaboration: Building Capacity in Developing Countries?* Rand Corporation) developed four categories of countries: scientifically advanced, scientifically proficient, scientifically developing and scientifically lagging.
72 Ha-Joon Chang, "Kicking Away the Ladder," *Post-Autistic Economics Review*, No. 15, 4 September 2002, article 3, **www.paecon.net**
73 In December 1970, Decision 24 of the Andean Group established rules for dealing with foreign capital and technology transfers, which were strongly criticised by countries having major investments in the region. "The consensus called for a drastic revamping and modernisation of the system and the need to reflect on how the international regime was structured." Pedro Roffe, ICTSD Senior Fellow, Intellectual Property Rights, interviewed by the EPO.
74 *Supra 70*, p 112-114.
75 "Integrating IPR and Development Policy," *Report of the Commission on IPR* (2002), p 21 **www.iprcommission.org**
76 EPO interview.
77 "Integrating IPR and Development Policy," *Report of the Commission on IPR* (2002), **www.iprcommission.org**
78 J Brinkhof, "Wensen op het gebied van het octrooirecht," *Bijblad Industriële Eigendom*, 16 September 2003.
79 *TRIPS and pharmaceutical patents*, WTO factsheet, September 2003 **www.wto.org/english/tratop_e/trips_e/tripsfactsheet_pharma_e.pdf**
80 Hal Weitzman "Ecuador threatens to become the first debtor with the ability to pay" and "Ecuador is something of a trendsetter," *Financial Times*, 16 February 2007.
81 "Indonesia accuses WHO of misusing flu sample," *Financial Times*, 8 February 2007.
82 Declaration on the TRIPS agreement and public health (2001) **http://snipurl.com/TRIPS_health** and, for an explanation, **www.wto.org/english/tratop_e/trips_e/healthdeclexpln_e.htm**
83 C Correa (2005), *IP after Doha: can South move its agenda on biodiversity and TK?*, **www.grain.org/rights/tripsreview.cfm?id=78**
84 Proposal by Argentina and Brazil for the Establishment of a Development Agenda for WIPO 2004 **http://snipurl.com/WIPODev1**
85 South Centre (2005), *Intellectual Property in investment agreements: the TRIPS-plus implications for developing countries*, **www.bilaterals.org/article.phpg?id_article=1999**
86 **www.grain.org/rights/tripsplus.cfm**
87 *Free Trade Agreements: Regional and Bilateral Trade Agreements* at **www.iprsonline.org/resources/FTA s.htm**
88 Nogues Julio (2004) *The roles of multilateralism and regionalism in Latin America*, ECLA.
89 *Supra 10*, p 111.
90 The Taskforce on STI of the Millennium Project 2005 Report states: "The ability of countries to acquire, master, adapt and improve upon scientific and technical knowledge is a major determinant of their capacity to achieve sustainable economic growth." See also UNCTAD portal *Reducing the Technology gap*, **www.unctad.org/templates/Page.asp?intItemID=3796&lang=1**
91 WG Park and JC Ginarte, "IPR and economic growth," *Contemporary Economic Policy* (Oxford Journals), Volume XV, Number 3, p 51-61.
92 EPO interview.
93 World Economic Forum, **www.weforum.org/en/fp/gcr_2006-07_highlights/index.htm**
94 Patti Waldmeir "US courts can't solve all world ills," *Financial Times*, 20 September 2006.

GREEN SCENARIO: TREES OF KNOWLEDGE

1 EPO Interview.
2 Mark Lemley (2001) "Rational Ignorance at the Patent Office," *Northwestern University Law Review*, Vol. 95 No. 4, p 1495 ff, note 3.
3 JH Barton (2000) "Reforming the Patent System," *Science* Vol. 287 (17 March 2000), p 1933-1934.
4 Francis Hagl (2004), "Serving two Masters: The balance between the applicant and the public," *Patent World*, nr. 161 (April 2004), p 22 ff.
5 "Who owns the knowledge economy?" and "Patent wars," *The Economist*, 8 April 2000, p 85-89.
6 "Patently absurd," *The Economist*, 23 June 2001, p 42-44.
7 Mazzoleni and Nelson (1998), "The benefits and costs of strong patent protection," *Research Policy* Vol. 27, 273–284.
8 Gallini and Scotchmer (2001) "Intellectual Property: When Is It the Best Incentive System?," *Economics Working Papers* E01-303, University of California at Berkeley.
9 Greg Aharonian (1999), "Does the patent office respect the software community," *IEEE Software, Jul/Aug 1999*, **www.bustpatents.com/articles/ieeeart.htm**
10 Manifeste pour les brevets, **http://www.medef.fr/site/core.php?pag_id=23548**
11 Reprinted by permission of GlobeScan® Incorporated, for research conducted on behalf of the World Economic Forum 2005.
12 J Nye, P Zelikow, D King (eds 1997), *Why people don't trust governments*, Harvard University Press.
13 Lichtman/Zogby poll (2006) "Gov't, corporate scandals damage public trust in institutions at the bedrock of society," **www.zogby.com/News/ReadNews.dbm?ID=1116**
14 EPO Interview.
15 Dominique Guellec and Bruno van Pottelsberghe de la Potterie (2000) "Applications, Grants and the Value of Patents," *Economic Letters*, Vol. 69 No. 1.

16 Jean Lanjouw (1999), "The quality of ideas: Measuring Innovation with multiple Indicators," *NBER Working paper No. 7345*.
17 EPO Interview.
18 EPO Interview.
19 *Hackers, Get Ready!* LEGO Group Announces Open Source Firmware, Developer Kits for LEGO® MINDSTORMS® NXT, 1 May 2006, **http://mindstorms.lego.com/press/2057/Open%20Source%20Announcement.aspx**
20 EPO Interview.
21 Arthur Allen (2001) "Who Owns My Disease?" *Mother Jones* Nov/Dec 2001, **www.motherjones.com/news/feature/2001/11/gene.html**
22 Rejection of software patent directive "a good result for European SMEs," **www.ueapme.com/docs/press_releases/pr_2005/050706_SoftwarePatent_rejected.pdf**
23 Declan McCullagh (2003) "Librarians issue file-sharin support," *CNET News.com*, **http://snipurl.com/CN etShare**
24 **www.cptech.org/a2k**
25 *Proposal by Argentina and Brazil for the establishment of a development agenda for WIPO* (2004) **http://snipurl.com/WIPODev1**
26 *Geneva Declaration on the Future of the World Intellectual Property Organization* (2004), **www.cptech.org/ip/wipo/genevadeclaration.html**
27 *Access to Knowledge Conference*, Yale, April 2006, **http://research.yale.edu/isp/eventsa2k.html**
28 Brian Kahin (2006), *Patent Reform for a Digital Economy*, Computer and Communications Industry Association white paper, **http://snipurl.com/KahinPatentReform**
29 *Diamond v Diehr*, US Supreme Court, 1981; *State Street Bank v Signature Financial Group*, US Court of Appeals for the Federal Circuit, 1998; EPO Boards of Appeal, T208/84 (Vicom), T 1173/97, T 935/97 (IBM) and T258/03 (Hitachi).
30 **www.patentfrei.de**
31 "No directive on software patents," *European Parliament Daily Notebook*, 6 July 2005, **http://snipurl.com/SWpatent001**
32 Tobias Buck, Maija Pesola and Raphael Minder, "EU software patent directive rejected," *Financial Times*, 6 July 2005.
33 BH Hall, RH Ziedonis (2001) "The Patent Paradox Revisited: An Empirical Study of Patenting in the US Semiconductor Industry, 1979-95," *Rand Journal of Economics*, 32(1): p 101-128.
34 **http://research.yale.edu/isp/wikiuploads/ybenklerpp.pdf**
35 Open Invention Network has received investments from IBM, NEC, Novell, Philips, Red Hat and Sony; **www.openinventionnetwork.com**
36 Daniel Lyons (2004) "Kill Bill," *Forbes* **http://forbes.com/forbes/2004/0607/086_print.html**
37 Ron Goldman and Richard Gabriel (2005), *Innovation happens elsewhere: Open Source as business strategy*, Morgan Kaufmann.
38 **www.ffii.org**
39 EPO Interview.
40 *Pew Internet Report 2000*, **www.pewinternet.org/PPF/r/7/press_release.asp**
41 EPO Interview.
42 YouTube "purge" **www.newscloud.com/read/75528** see also **http://snipurl.com/YouTubePurge**
43 *The Effects of Patenting in the AAAS Scientific Community, 2006*, **http://sippi.aaas.org**
44 The Royal Society (2003), *Keeping Science open: the effects of intellectual property policy on the conduct of science.*
45 Chris Dent, Paul Jensen, Sophie Waller and Beth Webster (2006), *Research use of patented knowledge: A review*, STI Working Paper 2006/2, OECD.
46 Yochai Benkler, "Commons-Based Strategies and the Problems of Patents," *Science*, 20 August 2004: Vol. 305. no. 5687, p 1110-1111.
47 Scott Lowry (2005), "Madey v Duke University Clarifies Patent Protection and Bolsters Patentee Rights," **www.pipra.org/docs/fplc/ScottMLowryFPLC2005_02.pdf**
48 **http://en.wikipedia.org/wiki/Pirate_party**
49 Other parties adopt anti-IP stance: **www.expressen.se/index.jsp?a=604834** cited in **www.wired.com/news/technology/0,71809-0.html?tw=wn_index_4**
50 James Boyle (1997), *A Politics of Intellectual Property: Environmentalism For the Net?* **www.law.duke.edu/boylesite/intprop.htm**
51 Michael Heller, Rebecca Eisenberg (1998), "Can Patents Deter Innovation? The Anticommons in Biomedical Research," *Science*, Vol. 280 No. 5364, p 698-701.
52 **http://en.wikipedia.org/wiki/Image:PiratePartiesMap3.svg**
53 Erik von Hippel, *Citizen Innovator: Thoughts on the Democratization of Innovation*, **www.changethis.com/pdf/22.03.CitizenInnovator.pdf**
54 Henry Chesbrough (2003), *Open Innovation: the new imperative for creating and profiting from technology*, Harvard University Press.
55 John Seely Brown and John Hagel III (2006), "Creation nets: Getting most from open innovation," *McKinsey Quarterly*, 2006 No. 2.
56 Brendan Koerner, "Geeks in Toyland," *Wired News*, 4 January 2006, **www.wired.com/news/culture/0,69946-0.html**
57 *The Future of the Internet II* (2006) at **www.pewinternet.org/PPF/r/188/report_display.asp**
58 Merrill Goozner (2004), *The $800m Pill: the truth behind the cost of new drugs*, The University of California Press.
59 Martin L Katz, Lisa V Mueller, Mark Polyakov & Steven F Weinstock, "Where have all the antibiotic patents gone?" *Nature Biotechnology* – 24, p 1529-1531 (2006) doi:10.1038/nbt1206-1529
60 *Patents vs. Patients: Five years after the Doha Declaration* (2006), **www.oxfam.org/en/files/bp95_patentsvspatients_061114/download**
61 Gerald Mossinghoff (1999) "Overview of the Hatch-Waxman Act and Its Impact on the Drug Development Process," *Food and Drug Law Journal*, Vol. 54.
62 Supplementary Protection Certificates (SPCs) came into force in 1993 (EU Regulation 1768/92) but have not been uniformly implemented. Pharma patents can be extended up to 5 years, but the extension is determined by national law.
63 *Data exclusivity and market protectio*, **www.egagenerics.com/gen-dataex.htm**
64 John Hagel III and John Seely Brown, "From Push to Pull," **http://www.johnseelybrown.com/pushmepullyou4.72.pdf**
65 John Hagel III and John Seely Brown, "From Push to Pull: The next frontier of innovation," *McKinsey Quarterly*, 2005 No. 3.
66 **www.innocentive.com**
67 European Generic Medicines Association (EGA), **http://www.egagenerics.com/gen-evergrn.htm**
68 Marcia Angell (2004) *The Truth About the Drug Companies: How They Deceive Us and What to Do About It*, Random House.
69 Jerry Avorn (2005) "Sending Pharma Better Signals," *Science*, 29 July 2005, Vol. 309. No. 5735, p 669.
70 Susan Okie (2006), "Global Health: The Gates-Buffett Effect," *New England Journal of Medicine*, Vol. 355: p 1084-1088, 14 September 2006.
71 The orphan drug laws: **www.orphan-europe.com/orphan_druglegislations.html**
72 B Sanders (2004) *The Medical Innovation Prize Fund Act*, **www.cptech.org/ip/health/hr417/hr417-summary.pdf**
73 Hubbard and Love (2004), *A new framework for global healthcare R&D*, PLoS Biol 2(2): e52, **http://snipurl.com/HubbardLove**
74 Dentico and Ford (2005), *The courage to change the rules: a proposal for an essential health R&D treaty*, PLoS Med 2(2): e14, **http://snipurl.com/DenticoFord**
75 Eva Tallaksen (2005), *World needs global R&D health treaty*, Science and Development Network, **http://snipurl.com/TallaksenWorld**
76 Joseph Stiglitz (2006), "Scrooge and intellectual property rights," *BMJ* 2006; 333: p 1279-1280 (23 December).
77 Dean Baker (2004) "Financing Drug Research: What are the issues?" *Center for Economic and Policy Research Issue Brief.*
78 Philip Stevens (2004), *Diseases of poverty and the 10/90 gap*, International Policy Network, **www.who.int/intellectualproperty/submissions/InternationalPolicyNetwork.pdf**
79 M Boldrin, DK Levin (2002), "The case against intellectual property," *American Economic Review Papers and Proceedings* 92(2), 209-212.
80 A Hollis (2004) *An Efficient Reward System for Pharmaceutical Innovation*, Department of Economics, University of Calgary, **http://econ.ucalgary.ca/fac-files/ah/drugprizes.pdf**
81 M Kremer (1998), "Patent Buyouts: A Mechanism For Encouraging Innovation," *Quarterly Journal of Economics*, MIT Press, Vol. 113(4), p 1137-1167.
82 *The Herceptin judgement*, **http://news.bbc.co.uk/1/hi/health/4684852.stm**
83 Dean Baker (2005), "Bird Flu Fears: Is there a better way to develop drugs?" *CEPR Issue Brief*, October 2005, **http://www.cepr.net/publications/intellectual_property_2005_10.pdf**
84 José Esquinas-Alcázar (2005), "Protecting crop genetic diversity for food security: political, ethical and technical challenges," *Nature Review Genetics*, Vol. 6, p 946-953.
85 **www.mindfully.org/Farm/2005/Global-Seed-Industry6sep05.htm**
86 Fernandez-Cornejo and Schimmelpfennig, "Have Seed Industry Changes Affected Research Effort?," *Amber Waves* February 2004 **www.ers.usda.gov/AmberWaves/February04/Features/HaveSeed.htm**
87 Bernard Buanec (2006), "Protection of plant-related inventions: Evolution and current discussion," *World Patent Information* 28; p 50-62.
88 The objective of the International Union for the Protection of New Varieties of Plants (UPOV) is the protection of new varieties of plants by an intellectual property right. **www.upov.int**
89 TRIPS agreement adopted in 1994, Art. 27.1, Art. 27.2 and Art. 27.3(b).
90 Gillian N. Rattray (2002), "The enola bean patent controversy: biopiracy, novelty and fish-and-chips," *Duke Law & Technology Review* 0008, **www.law.duke.edu/journals/dltr/articles/2002dltr0008.html**
91 Vandana Shiva (2001), *The Basmati Battle And its Implications for Biopiracy and Trips*, **www.globalresearch.ca/articles/SHI109A.html**
92 Indian Protection of Plant Varieties and Farmers' Rights (PPVFR) Act of 2001.
93 *Patent Protection for plant material*, lecture by Victoria Henson-Apollonio, CGIAR, WIPO-UPOV Symposium on the Coexistence of Patents and Plant Breeders' Rights, Geneva, 25 October 2002.
94 Decision of the EPO Enlarged Board of Appeal G1/98 – unless individually claimed, plant varieties are not excluded from patentability under Article 53(b) EPC.
95 Andy Coghlan(2003), "Complete rice sequence goes public at last," *New Scientist*, Issue 2377, 11 January 2003.
96 GRAIN, *Seedling*, July 1991, **http://www.grain.org/seedling/?id=360**
97 EPO Interview.
98 *Vatican 'cashes in' by putting price on the Pope's copyright*, 23 January 2006, **www.timesonline.co.uk/article/0,,13509-2005615,00.html**
99 Mohamad Mova Al 'Afghani (2005), *Islam and IP*, **http://incommunicado.info/node/197**
100 *Human Stem Cell Patents would be Unethical* (2001), discussion document for Conference of European Churches, **http://srtp.org.uk/stempat1.htm**
101 *Patenting, Genes and Living Organisms* (2003), Science, Religion and Technology Project, **http://srtp.org.uk/patent.shtml**
102 Church opposition to 'Oncomouse' patent, **www.european-patent-office.org/news/pressrel/2003_02_07_e.htm**
103 Church leaders on human cloning, **www.ad2000.com.au/articles/2001/decjan2001p6_885.html**
104 Vatican on cloned human embryos, **www.americancatholic.org/News/Cloning/vatican_cloning.asp**
105 Opposition of German churches to EP 301 749 *Particle mediated transformation of soybean and lines*, **www.european-patent-office.org/news/pressrel/2003_05_06_e.htm**
106 Opposition of church group Misereor to EP0744888, **www.eineweltnetzbayern.de/downloads/Rundbrief%2019.pdf**
107 European Ecumenical Commission for Church and Society on life patents (submission to the European Parliament) (1997) **www.srtp.org.uk/meppatlk.htm**
108 Pew Forum on Religion and Public life (2005), *From Darwin to Dover: An Overview of Important Cases in the Evolution Debate*, **http://pewforum.org/publications/reports/evolution-cases.pdf**
109 E Edward Wilson (2006), *The Creation: An appeal to save life on earth*, WW Norton.
110 Nuffield Council Report (2002), *The ethics of patenting DNA*, **http://www.nuffieldbioethics.org/go/ourwork/patentingdna/publication_310.html**
111 OECD (2002), *Genetic inventions, intellectual property rights and licensing practices*, **http://www.oecd.org/dataoecd/42/21/2491084.pdf**
112 Bioethics and patent law: "The case of Myriad," *WIPO Magazine*, August 2006, **http://www.wipo.int/wipo_magazine/en/2006/04/article_0003.html**
113 B Verbeure, G Matthijs & G Van Overwalle, "Analysing DNA patents in relation with diagnostic genetic testing," *European Journal of Human Genetics* (EJHG), vol. 1, January 2006, p. 26-33. [advance online publication, 12 October 2005; doi:10.1038/sj.ejhg.5201503].
114 Commission of the European Communities. Report from the Commission to the European Parliament and the Council. Development and implications of patent law in the field of biotechnology and genetic engineering. COM(2002) 545 final (EC, Brussels, Brussels) **http://www.europa.eu.int/eur-lex/en/com/rpt/2002/com2002_0545en01.pdf** (7 October 2002).
115 Stéphanie Bodoni (2005) "European Parliament questions patent grant," *Managing Intellectual Property*, March 2005.
116 Hopkins, Mahdi, Patel and Thomas (2007) "DNA Patenting: The end of an era?" *Nature Biotechnology*, Vol. 25 No. 2, February 2007.
117 EPO Interview.
118 Alain Pompidou (1993), *Research on the human genome and patentability: The ethical consequences* in Proceedings of the Third International Bioethics Seminar, 19- 21 November 1993, p 175-178. **www.eubios.info/IN D/IN DAP.htm**
119 Legality of gene selection: **www.bionetonline.org/English/Content/db_leg2.htm#genes**
120 *UN vote urges human cloning ban*, **http://news.bbc.co.uk/1/hi/health/4328919.stm** 8 March 2005.
121 P Slovic, B Fischhoff, S Lichtenstein, *In Perilous Progress: Managing the Hazards of Technology*, RW Kates, C Hohennemses, JX Kasperson (eds) Westview, Boulders, CO, 1985, p 91-125.
122 EPO Interview.
123 European Parliament resolution on patents for biotechnological inventions, 26 October 2005, **http://www.europarl.europa.eu/sides/getDoc.do?objRefId=102714&language=EN**
124 Stephen Hilgartner (2002), "Acceptable Intellectual Property," *Journal of Molecular Biology*, Vol. 319 No. 4, June 2002, p 943-946(4).
125 Jensen and Murray (2005) "Intellectual Property Landscape of the Human Genome," *Science*, Vol. 310 No. 5746, p 239-240.
126 *Gowers Review of Intellectual Property* (2006), **http://snipurl.com/Gowers1**

127 *Monsanto Canada v Schmeiser et al.* 2002 FCA 309 Federal Court of Appeal (4 September 2002).
128 *Nature Biotechnology* Vol. 19, No. 5, p 396-397 (2001) doi:10.1038/88013.
129 L Pressman, R Burgess, RM Cook-Deegan, SJ McCormack, I Nami-Wolk, M Soucy, L Walters (2006) "The licensing of DNA patents by US academic institutions: an empirical survey," *Nature Biotechnology,* Vol. 24, No. 1, p 31-39 (copyright 2006) doi:10.1038/nbt 0106-31.

BLUE SCENARIO: BLUE SKIES

1 Paul S Peercy, "The drive to miniaturization," *Nature* 406, (2000), p 1023-1026
2 RR Tummala says "component density" should climb from about 50 per square centimetre in 2004 to about a million per square centimetre by 2020, *Spectrum Online*, June 2006, **www.spectrum.ieee.org/jun06/3649**
3 James Canton, "Designing The Future, NBIC Technologies and Human Performance Enhancement," *Ann. N.Y. Acad. Sci.* 1013: p 186-198 (2004).
4 Thomas Homer-Dixon (2000) *The Ingenuity Gap*, p 111-113.
5 Philip S Anton, Richard Silberglitt, James Schneider (2001) *The Global Technology Revolution*, Rand Corporation.
6 Hannu Jaakkola, "Fundamentals of technology diffusion and mobile phone case study," *Circuits, Signals and Signal Processing* 17(3), 1998, p 424.
7 William Kingston, *Meeting Nelson's Concerns About Intellectual Property*, Nelson and Winter Conference in Aalborg, June 2001, **www.druid.dk/conferences/nw/ paper1/kingston.pdf**
8 James Bessen, Eric Maskin (1999, revised 2006) *Sequential Innovation, Patents and Imitation*, **www.sss.ias.edu/ publications/papers/econpaper25.pdf**
9 Fiona Murray, Siobhan O'Mahony, *Reconceptualizing the Institutional Foundations of Cumulative Innovation*, manuscript prepared for the Princeton Conference on Intellectual Property Rights May 2005.
10 Patricia Abril, Robert Plant, *The Patent Holder's Dilemma – Communication of the ACM*, January 2007, Vol. 50 No. 1 p 37-44.
11 John Hagel III, "Spider versus spider," *McKinsey Quarterly*, 1996 No. 1, p 4-18.
12 Paul Festa and Joe Wilcox "Experts estimate damages in the billions for bug," *CNET News.com*, 5 May 2000, http://news.com.com/Experts+estimate+damages+in+the+billions+for+bug/2100-1001_3-240112.html,
13 Edward Tenner (1996), *Why Things Bite Back: Technology and the Revenge of Unintended Consequences*, Random House.
14 NYISO final report on the blackout, **www.nyiso.com/public/webdocs/newsroom/press_releases/2005/blackout_rpt_final.pdf**
15 "US patent office rules against patent in BlackBerry fight," *Associated Press,* 2 February 2006.
16 Siemens Scenarios, *Horizons 2020*, **http://snipurl.com/ Siemens_Horizons**, p 165.
17 Mark Weiser, *Ubiquitous Computing*, **http://sandbox.xerox.com/ubicomp/** and Mark Weiser, "The Computer for the twenty-first century," *Scientific American* 1991, p 94-104.
18 GE Moore, "Cramming more components into integrated circuits," *Electronics*, 38(8), (1965).
19 R Kurzweil, *The Law of Accelerating Returns*, 7 March 2001, **http://lifeboat.com/ex/law.of.accelerating.returns**
20 Richard Silberglitt, Philip S Anton, David R Howell, Anny Wong, Natalie Gassman, Brian A Jackson, Eric Landree, Shari Lawrence Pfleeger, Elaine M Newton, Felicia Wu (2006) *The Global Technology Revolution 2020 – In-Depth Analyses*, Rand Corporation, p 205.
21 James Bessen, Robert Hunt, *An empirical look at software patents*, Federal Reserve Bank of Philadelphia, March 2004.
22 Stuart JH Graham & David C Mowery (2003), "Intellectual Property Protection in the US Software Industry" in *Patents in the Knowledge-Based Economy*, Haas School of Business.
23 EICTA Interoperability white paper June 2004, **http://www.eicta.org/fileadmin/user_upload/document/document1166548285.pdf**
24 Yochai Benkler "Commons-Based Strategies and the Problems of Patents," *Science*, Vol. 305 No. 5687, 2004, p1110-1111.
25 **www.kite-surf.com/tips/archiv.php?param=8**
26 **www.theoscarproject.org**
27 EPO Interview.
28 Torrisi & Thoma (2006) CESPRI cited in Rishab Aiyer Ghosh, *Software patents, economic evidence and competition*, Open Forum on the Substantive Patent Law Treaty, WIPO, Geneva, 3 March 2006.
29 Rishab Aiyer Ghosh, *Software patents, economic evidence and competition*, Open Forum on the Substantive Patent Law Treaty, WIPO, Geneva, 3 March 2006.
30 "Patents And Innovation: Trends And Policy Challenges," *OECD Report* 2004
31 Garry D Brewer, "The challenges of interdisciplinarity," *Policy Sciences* 32: p 327-337, 1999.
32 Report for the European Commission, *Converging Technologies-Shaping the Future of European Societies*, 2004, **http://europa.eu.int/comm/research/conferences/2004/ntw/pdf/final_report_en.pdf**
33 W Bibel (ed 2004) "Converging Technologies and the Natural, Social and Cultural World," *Special Interest Group Report for the European Commission*, p 5.
34 MC Roco, "The emergence and policy implications of converging new technologies integrated from the nanoscale," *Journal of Nanoparticle Research* (2005) 7: p 129-143.
35 "Converging technologies for improving human performance," *US National Science Foundation and Department of Commerce*, June 2002, p 37 and 59.
36 Ray Kurzweil (2005) *The Singularity is Near: when Humans transcend Biology*, Viking/Penguin Group.
37 Wendy H Schacht (2006), *Patent Reform: Issues in the Biomedical and Software Industries*, CRS Report for Congress, in particular p 9-12.
38 G Overwalle, E Zimmeren, B Verbeure, G Matthijs, *Nature Reviews Genetics*, Vol 7, 2006, p 143-148.
39 MA Heller, RS Eisenberg, *Science* 280, 1998, p 698-701
40 Carl Shapiro (2001) *Navigating the patent thicket*, **http://faculty.haas.berkeley.edu/shapiro/thicket.pdf**
41 J Bessen (2003) *Patent Thickets: Strategic Patenting of Complex Technologies*, **http://www.researchoninnovation.org/thicket.pdf**
42 "To Promote Innovation: The Proper Balance of Competition and Patent Law and Policy," *Report by the US Federal Trade Commission*, October 2003, p 6, 8.
43 Bronwyn Hall, *Exploring the Patent Explosion*, Stanford Seminar, 2004, **http://elsa.berkeley.edu/~bhhall/papers/BHH04_patentexplosionslides.pdf**
44 Iwan von Wartburg, Martin Möhrle, Lothar Walter, Thorsten Teichert, *Patents as resources*, Proceedings of the IFSAM VIIIth World Congress 2006, September 28-30, Berlin, Germany, **www.ctw-congress.de/ifsam/download/track_6/pap00747.pdf**
45 *Strategic Dimensions of Intellectual Property Rights in the context of Science and Technology Policy*, prepared by an independent ETAN Expert Working Group for the European Commission Directorate General XII, June 1999, **http://ec.europa.eu/research/era/pdf/ipr-expertgroupreport.pdf**
46 **http://snipurl.com/Cyber_girl**
47 JA Goldstein, TJ Ebersole, MC Guthrie, AA Hirschfeld, BJ van den Broek, "Patent pools as a solution to the licensing problems of diagnostic genetics," *Drug Discovery World,* Spring 2005, p 86-90.
48 Nicholas Stern (2006) *The Economics of Climate Change*, Cabinet Office/HM Treasury/Cambridge University Press, **http://snipurl.com/11fp8** p 351.
49 Markus Reitzig, Joachim Henkel, Christopher Heath (2006) *On Sharks, Trolls, and Their Patent Prey*, **www.inno-tec.de/epip/submissions/Joachim%20Henkel_Trolls.pdf**
50 Gwilym Roberts, "Patent trolls – new name – old problem?" *CIPA Journal* August 2005, p 522.
51 Gwilym Roberts, "Patent trolls – new name – old problem?" *CIPA Journal* August 2005, p 523.
52 J Berke, F Thelen, "Ein Patentstreit bedroht den BlackBerry-Hersteller Research In Motion," *WirtschaftsWoche*, 8 December 2005, Nr. 50, p 76-78.
53 Settlement Reached In BlackBerry Patent Case, **www.msnbc.msn.com/id/11659304/**
54 "The real lesson of BlackBerry," *The Economist*, 14 December 2005.
55 William Henriques, team leader at the US Office of Public Health Emergency Preparedness cited in *PCWorld*, 2 February 2006, **www.pcworld.com/article/id,124596-page,1/article.html**
56 Stephen Lawson, BlackBerry users have expressed relief at the $612.5 million settlement and annoyance at the lawsuit, *InfoWorld*, 3 March 2006, **http://snipurl.com/IW_on_RIM**
57 Michel Singer, "NTP patent keeps BlackBerry in a jam," *CNET News,* 29 June 2005, **http://news.com/2102-1041_3-5765510.html**
58 Tom Krazit and Anne Broache, "BlackBerry saved," *CNET News*, 3 March 2006, **http://news.com.com BlackBerry+saved/2100-1047_3-6045880.html**
59 Peter Bollack, "eBay patent case arrives at supreme court," *ars technica,* 28 March 2006.
60 Eric Bangeman, "Supreme court sides with eBay in patent case," *ars technica,* 15 May 2006.
61 IBM Amicus Brief to the US Supreme Court in the case *eBay v MercExchange*, 26 January 2006.
62 Anick Jesdanun, "Patent Spat Kills Anti-Spam Plan," *CBS News*, 28 September 2004, **www.cbsnews.com/stories/2004/09/28/tech/main645915.shtml**
63 *Patent Trolls: Fact Or Fiction?* Hearing before the Subcommittee On Courts, The Internet, And Intellectual Property of the Committee On The Judiciary House Of Representatives, 15 June 2006 Serial No. 109–104, p 1.
64 E Kintisch, "Intellectual property: What Good Is a Patent? Supreme Court May Suggest an Answer," *Science,* 311, 2006, p 946-947.
65 Peter Halkjoer, Senior IP Manager for Mobile Phones at Nokia, cited in M Reitzig et al., *On Sharks, Trolls, and Their Patent Prey* **www.inno-tec.de/epip/submissions/Joachim%20Henkel_Trolls.pdf**
66 Tim Frain, *Patents in Standards & Interoperability*, WIPO Seminar, November 2006, **www.wipo.int/patent/colloquia/en/2006/11/index.html**
67 Jean-Francois Abramatic cited in *InfoWorld*, 9 November 2004, **http://snipurl.com/SWpatent002**
68 Patentschutz oder Urheberrecht?, VDI Nachrichten (2002) **www.vdi-nachrichten.com/vdi_nachrichten/aktuelle_ausgabe/akt_ausg_detail.asp?ID=9846**
69 European Consumers' Organisation (2005), Directive on the patentability of computer-implemented inventions, BEUC comments on the Common Position of the Council, **www.softwarepatenten.be/doc/beuc.pdf**
70 Hajime Yamada, "Patent Exploitation in the Information and Communications Sector," *Science & Technology Trends, Quarterly Review* No. 19, April 2006, p 17.
71 Paul Davey *Patents & Standards WIPO Seminar*, November 2006, **www.wipo.int/patent/colloquia/ en/2006/11/index.html**
72 Hajime Yamada, "Patent Exploitation in the Information and Communications Sector," *Science & Technology Trends, Quarterly Review* No. 19, April 2006, p 18.
73 Johann Verbruggen, Anna Lörincz, Patente und technische Normen, *GRUR Int.* 2002, 10, 816-829, translated from German.
74 Rudi Bekkers, Geert Duysters, Bart Verspagen, *Intellectual property rights, strategic technology agreements and market structure The case of GSM*, Research Policy 31(7), 2002, p 1141-1161.
75 Bary Alyssa Johnson, Mark Hachmann, "AT&T Warns Apple, Others, Of Patent Infringement," *PC Magazine*, 2 September 2006, **www.pcmag.com/article2/0,1759,1923218,00.asp**
76 Details of the multiple owners of the MPEG-4 Visual Patent Portfolio License: **www.mpegla.com/m4v/m4v-patentlist.cfm**
77 "Patent application jeopardizes IETF syslog standard," *NewsForge,* 27 November 2006.
78 Robert P Merges, *Institutions For Intellectual Property Transactions (1999) The Case for Patent Pools* **http://www.law.berkeley.edu/institutes/bclt/pubs/merges/pools.pdf**
79 Jeanne Clark (2000) *Patent Pools: A Solution To The Problem Of Access In Biotechnology Patents?*, USPTO **www.uspto.gov/web/offices/pac/dapp/opla/patentpool.pdf**
80 Bjorn Hjelm, "Standards and Intellectual Property Rights – The International Standardization of Third-Generation Mobile System," *Computers and Communications*, 2000. Fifth IEEE Symposium, p 274-279.
81 Harry T Dykman, "Patent Licensing within The Manufacturer's Aircraft Association (MAA)," *46 J. Pat. Off. Soc'y* 646, 648 (1964) cited in Jeanne Clark, *Patent Pools: A Solution To The Problem Of Access In Biotechnology Patents?* USPTO, 5 December 2000 **www.uspto.gov/web/offices/pac/dapp/opla/patentpool.pdf**
82 Letter from Joel Klein, Assistant Attorney General, Department of Justice, Antitrust Division, to Gerrard Beeney (June 26, 1997) cited in Jeanne Clark, *Patent Pools: A Solution To The Problem Of Access In Biotechnology Patents?* USPTO, 5 December 2000 **www.uspto.gov/web/offices/pac/dapp/opla/patentpool.pdf**.
83 Letter from Joel Klein, Assistant Attorney General, Department of Justice, Antitrust Division, to Gerrard Beeney (16 December 1998) cited in Jeanne Clark, *Patent Pools: A Solution To The Problem Of Access In Biotechnology Patents?* USPTO, 5 December 2000 **www.uspto.gov/web/offices/pac/dapp/opla/patentpool.pdf**.
84 EPO Interview.
85 Brian Kahin, "Patent Reform for a Digital Economy," *White Paper of the Computer & Communications Industry Association CCIA*, November 2006, executive summary and p 8.
86 "To Promote Innovation: The Proper Balance of Competition and Patent Law and Policy," *Report by the US Federal Trade Commission*, October 2003, p 6 of executive summary and chapter 3.
87 Kamiel J Koelman "An Exceptio Standardis: Do We Need an IP Exemption for Standards?," *IIC International Review of Intellectual Property and Competition Law 2006, Heft 7,* p 823-843.
88 C Geiger, RM Hilty, "Patenting Software? A Judicial and Socio- Economic Analysis," *International Review of Intellectual Property and Competition Law* 2005 Heft 6, p 615-754.
89 JH Reichman, "Of Green Tulips and Legal Kudzu: Repackaging Rights in Subpatentable Innovation," *Van derBelt Law Review*, Vol. 53:6, p 1743-1798
90 "Criteria are that the infringed party has suffered an irreparable injury; that remedies available at law are inadequate to compensate for that injury; that considering the balance of hardships between the infringing and infringed party, a remedy in equity is warranted; and that the public interest would not be disserved by a permanent injunction," Decision of the US Supreme Court, **www. supremecourtus.gov/opinions/05pdf/05-130.pdf**
91 Article 20 of the proposal for a Council Regulation on the Community patent (2000) **http://register.consilium.eu.int/pdf/en/03/st10/st10404en03.pdf**
92 Article 9a of the draft Swiss Patent Convention **www.oecd.org/dataoecd/40/47/36817454.pdf**
93 World Public Sector Report 2005: *Unlocking the Human Potential for Public Sector Performance*, UN, **http://unpan1.un.org/intradoc/groups/public/documents/un/unpan021616.pdf**
94 Beth Noveck, "Peer to Patent: Collective Intelligence and Intellectual Property Reform," *Abstract*, March 2006, **http://dotank.nyls.edu/communitypatent/docs/openreview_sep_02.pdf**

95 "Patents for the people," *Nature* 441, 256, 18 May 2006.
96 Eli Kintisch, "US Patent Policy: PTO Wants To Tap Experts To Help Patent Examiners," *Science,* Vol. 312 No. 5776, 2006, p 982.
97 Nicholas Varchaver, "Patent review goes Wiki," *Fortune Magazine,* 16 August 2006.
98 **www.wikipatents.com/**
99 **www.eff.org/deeplinks/archives/005004.php**
100 "Q&A: Junk-Patent Perps, Beware of BountyQuest," *BusinessWeek Online*, 30 April 2001.
101 The future of electronic scientific literature, *Nature*, Vol. 413 No. 6851, 2001, p 1-3.
102 Steve Buckingham, "Bioinformatics: Data's future shock," *Nature* 428, (2004), p 774-777.
103 John Markoff, Entrepreneurs see a web guided by common sense, *New York Times*, 12 November 2006, **http://www.nytimes.com/2006/11/12/business/12web.html?ex=1320987600&en=254d697964cedc62&ei=5088**
104 **http://www.opte.org/maps/**
105 **http://www.kurzweilai.net/articles/art0134.html?printable=1**
106 From a presentation by Rishab Ghosh at WIPO *Software patents, economic evidence and competition*, based on data analysed by Salvo Torrisi and Grid Thoma at CESPRI, as part of the European Commission DG INFSO funded "Study into effects of allowing patent claims on computer-implemented inventions."
107 OECD patent database, November 2003. Cited in *Patents and innovation: Trends and policy challenges*, OECD Report 2004, refer to **http://www.oecd.org/dataoecd/48/12/24508541.pdf**
108 World Economic Forum, "Global Risks 2007," *A Global Risk Network Report*, January 2007. page 13, **http://www.weforum.org/pdf/CSI/Global_Risks_2007.pdf**

USING THE PATENT SYSTEM
1 **http://www.wipo.int/pct/en/pct_strategies/filing.pdf**
2 **http://www.wipo.int/pct/en/basic_facts/faqs_about_the_pct.pdf**
3 **http://www.wipo.int/pct/en/fees.pdf**

FURTHER READING
Patents, IP and Economy
WM Cohen and SA Merrill (eds), *Patents in a Knowledge-Based Economy*, National Research Council, 2003. **www.nap.edu/catalog/10770.html**

SA Merrill, RC Levin, MB Meyers (eds), *A Patent System for the 21st Century*, National Research Council, 2004. **www.nap.edu/catalog/10976.html**

FTC (2003), *To promote innovation: The proper balance between competition and patent law and policy* **http://www.ftc.gov/os/2003/10/innovationrpt.pdf**

USPTO: Transforming To Meet the Challenges of the 21st Century, National Academy of Public Administration, 2005. **www.napawash.org/Pubs/PTO8-25-05.pdf**

Propriété intellectuelle, reports by J Tirole, C Henry, M Trommetter, L Tubania, and B Caillaud, Conseil d'Analyse Économique du Premier Ministre, 2003. **www.ladocumentationfrancaise.fr/rapportspublics/034000448/index.shtml**

Maurice Lévy Jean-Pierre Jouyet (2006), *Rapport de la commission sur l'economie de l'immmatériel*, **http://www.finances.gouv.fr/directions_services/sircom/technologies_info/immateriel/immateriel.pdf**

Kamil Idris, *Intellectual property: A power tool for economic growth*, **http://www.wipo.int/about-wipo/en/dgo/wipo_pub_888/index_wipo_pub_888.html**

Kamil Idris and Hisamitsu Arai, *The Intellectual Property-Conscious Nation: Mapping the Path from Developing to Developed*, WIPO Publication No.988 (E), **http://www.wipo.int/about-wipo/en/dgo/wipo_pub_988/index.html**

Keith E Maskus, *Reforming US Patent Policy*, CSR No. 19, November 2006, Council on Foreign Relations.

Suzanne Scotchmer (2004), *Innovation and Incentives*, MIT Press.

François Lévêque and Yann Ménière, *Patents and Innovation: Friends or Foes?* Cerna, Centre d'économie industrielle.

Ecole Nationale Supérieure des Mines de Paris, 2006, **http://www.cerna.ensmp.fr/Documents/FL-YM-PatentsInnovationJanuary07.pdf**

Creating an Innovative Europe: Report of the Independent Expert Group on R&D and Innovation appointed following the Hampton Court Summit and chaired by Esko Aho, **http://ec.europa.eu/invest-in-research/pdf/download_en/aho_report.pdf**

R Polk Wagner and Gideon Parchomovsky, "Patent Portfolios," November 2005 *University of Pennsylvania Law Review*, Vol. 154, No. 1, **http://papers.ssrn.com/sol3/papers.cfm?abstract_id=582201**

Innovation: Applying knowledge in development, UN millenium project, Taskforce on Science, Technology and Innovation, 2005, **http://www.unmillenniumproject.org/reports/tf_science.htm**

Current and emerging intellectual property issues for business: A roadmap for business and policy makers, International Chamber of Commerce, 2006, **http://www.insme.info/documenti/Roadmap-2005-FINAL.pdf**

Stephen E Siwek, *Engines of Growth: Economic Contribution of the US Intellectual Property Industries*, 2005, Economists Incorporated.

D Guellec, B van Pottelsberghe de la Potterie, *The Economics of the European Patent System,* Oxford University Press, 2007.

IP and Health
Commission on Intellectual Property Rights, Innovation and Public Health (CIPIH) of WHO, Public health, innovation and intellectual property rights, 2006, **http://www.who.int/intellectualproperty/report/en/**

Civil Society Report on Intellectual Property, Innovation and Health, 2006, **http://www.policynetwork.net/main/content.php?content_id=47**

IP and development
Innovation: Applying knowledge in development, UN millenium project, Taskforce on Science, Technology and Innovation, 2005, **http://www.unmillenniumproject.org/reports/tf_science.htm**

Keith E Maskus and Jerome H Reichman (eds), *International public goods and transfer of technology: Under a globalized intellectual property regime*, Cambridge University Press, 2005.

Resource Book on TRIPS and Development, UNCTAD-ICTSD Project on IPRs and Sustainable Development, Cambridge University Press, 2005.

Commons and Public domain
The Commons Rising, A Report to Owners from the Tomales Bay Institute. **http://snipurl.com/CommonsRising**

Peter Barnes (2006) *Capitalism 3.0: a guide to reclaiming the commons*. **http://snipurl.com/Capitalism3**

Philippe Aigrain, *Cause commune : l'information entre bien commun et propriété* (Common Cause: Information Between Commons and Property), Editions Fayard (2005), **http://www.causecommune.org/**

Yochai Benkler, *The Wealth of Networks: How Social Production Transforms Markets and Freedom*, Yale University Press, 2006, **http://www.benkler.org/Benkler_Wealth_Of_Networks.pdf**

Kembrew Mcleod, *Freedom of Expression®: Overzealous Copyright Bozos and Other Enemies of Creativity*, Random House/Doubleday 2005, **http://kembrew.com/documents/mcleod-freedomofexpression3.pdf**

Michele Boldrin, David K Levine, *Against intellectual monopoly*, **http://www.dklevine.com/general/intellectual/against.htm**

Sebastian Bödeker, Oliver Moldenhauer, Benedikt Rubbel, Wissensallmende, ATTAC Basistexte 15, **https://www.attac.de/wissensallmende/basistext/AttacBT_15_Wissensallmende_hoch.pdf**

James Boyle, "The Second Enclosure Movement and the Construction of the Public Domain." *Law and Contemporary Problems*, Vol. 66, p 33-74, Winter-Spring 2003 Available at SSRN: **http://ssrn.com/abstract=470983 or DOI: 10.2139/ssrn.470983**

Lawrence Lessig, *Free Culture: How Big Media Uses Technology and the Law to Lock Down Culture and Control Creativity*, 25 March 2004, The Penguin Press, **http://www.free-culture.cc/**

Civil Society and NGOs
Leni Wild (2006) *Strengthening Global Civil Society*, IPPR, April 2006.

Daniel Drezner (2005) *Gauging the power of global civil society: Intellectual property and health*, **www.danieldrezner.com/research/gauginggcs.pdf**

Ann Florin (ed 2001) *The Third Force: The Rise of Transnational Civil Society*, Carnegie Endowment for International Peace and Japan Center for International Exchange.

Rodney Bruce Hall and Thomas Biersteker (2003) *The Emergence of Private Authority in Global Governance*, Cambridge University Press.

Dorthea Hilhorst (2003) *The Real World of NGOs: Discourses, Diversity and Development*, Zed Books.

Joan Roelofs (2003) *Foundations and Public Policy: The Mask of Pluralism*, State University of New York Press.

Sydney Tarrow (2005) *The New Transnational Activism,* Cambridge University Press.

H Teegen (2003) "International NGOs as Global Institutions: Using Social Capital to Impact Multinational Enterprises and Governments," *Journal of International Management.*

H Teegen, J Doh, S Vachani (2004) "The importance of nongovernmental organisation in global governance and value creation: an international business research agenda," *Journal of International Business Studies* Vol. 35 No. 6.

Innovation, Collaboration, Open Source
Henry Chesbrough, Wim Vahaverbeke and Joel West (eds. 2006) *Open innovation: A new paradigm for understanding industrial innovation*, Oxford University Press.

Committee on Prospering in the Global Economy of the 21st Century: An Agenda for American Science and Technology, National Academy of Sciences, National Academy of Engineering, Institute of Medicine: *Rising Above The Gathering Storm: Energizing and Employing America for a Brighter Economic Future,* The National Academies Press, 2007, **http://www.nap.edu/catalog.php?record_id=11463**

Andrew McAfee (2006), "Enterprise 2.0: The Dawn of Emergent Collaboration," *MIT Sloan Management Review* Vol. 47 No. 3, p 21-28.

Eric van Hippel, *The Sources of Innovation*, Oxford University Press, 1988, **http://web.mit.edu/evhippel/www/sources.htm**

Eric van Hippel, *Democratizing Innovation*, The MIT Press Cambridge, Massachusetts, 2005, **http://web.mit.edu/evhippel/www/democ1.htm**

Janet E Hope, *Open Source Biotechnology* (23 December 2004). Available at SSRN: **http://ssrn.com/abstract=755244**

Globalisation
Martin Wolf (2004) *Why Globalization Works*, Yale University Press.

Jeremy Rifkin (2001), *The Age of Access: The New Culture of Hypercapitalism, Where all of Life is a Paid-For Experience.*

Manfred B Steger (2004) *Globalization: A Very Short Introduction*, Oxford University Press.

Scenarios
Shell (2003) *Scenarios: An Explorer's Guide*, Global Business Environment, Shell International Ltd, London.

K Van der Heijden (1997) *Scenarios: The Art of Strategic Conversation,* John Wiley and Sons, Chichester.

P Wack (1985) "Scenarios: Shooting the Rapids," *Harvard Business Review*, November-December 1985, p 139-150.

NOTE:
During the course of this work an extensive scenario study on the future of intellectual property has been undertaken by the French government:

Rapport du groupe de projet PIÉTA (Prospective de la Propriété Intellectuelle pour l'ÉTAt stratège): Quel système de propriété intellectuelle pour la France d'ici 2020?, December 2006 **http://www.cawa.fr/IMG/pdf/Rapport_PIETA_2006.pdf**

Although there are a number of common findings, the studies have been conducted completely independently.

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