

# A market for ideas

## Also in this section

### Patent sense

How the system works. Page 6

### The arms race

Companies are preparing for the intellectual-property battle. Page 8

### Voracious venture

A new intellectual-property business model. Page 12

### An open secret

Sharing intellectual property can be more profitable than keeping it to yourself. Page 14

### Thinking for themselves

India and China aim to challenge western tech firms through innovation, not just cheap labour. Page 18

### The liquidity of innovation

How the new market for intellectual property is changing the technology industry. Page 23

Intellectual-property protection can be good for the technology industry as well as for its customers, says Kenneth Cukier. But it requires careful handling

“The granting [of] patents ‘inflames cupidity’, excites fraud, stimulates men to run after schemes that may enable them to levy a tax on the public, begets disputes and quarrels betwixt inventors, provokes endless lawsuits... The principle of the law from which such consequences flow cannot be just.”

*The Economist* may have put it rather strongly in 1851, but its disapproval of patents represented conventional wisdom at the time. A century earlier, Adam Smith had described them as necessary evils, to be handed out sparingly, and many other economists have since echoed his reservations. Patents amount to temporary monopolies on useful new inventions.

In recent years intellectual property has received a lot more attention because ideas and innovations have become the most important resource, replacing land, energy and raw materials. As much as three-quarters of the value of publicly traded companies in America comes from intangible assets, up from around 40% in the early 1980s. “The economic product of the United States”, says Alan Greenspan, the chairman of America’s Federal Reserve, has become “predominantly conceptual”. Intellectual property forms part of those conceptual assets.

In information technology and telecoms in particular, the role of intellectual property has changed radically. What used to be the preserve of corporate law-

yers and engineers in R&D labs has been speedily embraced by the boardroom. “Intellectual-asset management” now figures as a strategic business issue. In America alone, technology licensing revenue accounts for an estimated \$45 billion annually; worldwide, the figure is around \$100 billion and growing fast.

Technology firms are seeking more patents, expanding their scope, licensing more, litigating more and overhauling their business models around intellectual property. Yet paradoxically, as some companies batten down the hatches, other firms have found ways of making money by opening up their treasure-chest of innovation and sharing it with others. The rise of open-source software is just one example. And a new breed of companies has appeared on the periphery of today’s tech firms, acting as intellectual-property intermediaries and creating a market for ideas.

### Mind the keep-out signs

At the same time, however, the legitimacy of many patents granted is in question as patent offices struggle with the huge increase in demand. Over the past decade the number of patent applications has nearly doubled and continues to climb. Much of that growth has been in the IT and telecoms field: in America alone, that sector’s overall share of patents has increased from around 30% in 1990 to almost 40% today. Also climbing, alas, is the number of ▶▶

#### Acknowledgments

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A list of sources can be found online

[www.economist.com/surveys](http://www.economist.com/surveys)

An audio interview with the author is at

[www.economist.com/audio](http://www.economist.com/audio)

Past articles on intellectual property are at

[www.economist.com/intellectualproperty](http://www.economist.com/intellectualproperty)

▶ lawsuits over patent infringement, the cost of litigation, and the amount of money plaintiffs are winning.

Meanwhile, emerging technology powerhouses such as China and India are competing to move up from lower-end work such as hardware manufacturing and software coding to more sophisticated projects requiring their own innovation. This could pose serious challenges to today's incumbents. The number of patents granted at China's patent office has trebled in the past four years alone.

"Intellectual property has become more central to the industry," says Greg Papadopoulos, chief technology officer of Sun Microsystems. "I don't know if that is a function of a mature industry, or simply a confused one."

#### Licensed to make money

The facts and figures speak for themselves. IBM alone now earns over \$1 billion annually from its intellectual-property portfolio. HP's revenue from licensing has quadrupled in less than three years, to over \$200m this year. Microsoft is on course to file 3,000 patents this year, when in 1990 it received a mere five. Earlier this year it set up an entirely new corporate division to exchange its technology for cash or equity in start-up firms. Nokia has recently started licensing its technology to other firms and plans to do more. And some companies, such as ARM, a British firm that designs the blueprints for microchips used in wireless devices, do little other than create and sell intellectual property.

According to a survey of business executives last year by McKinsey, a consultancy, 54% of companies saw growth in licensing of 10-50% between 2000 and 2002. Almost 75% of executives say they expect to buy as well as sell more licences over the next two to five years, and 43% expect a dramatic increase in their licensing revenue. And they think the market is still embryonic. "Many companies generate a lot of intellectual property and do not capture the value from it," says Jay Jubas of McKinsey.

The new predominance of intellectual property in technology industries is fed by a number of broader industry trends. First, IT and telecoms have become so complex that there is a greater willingness to accept the innovations of others. Gone are the days when vertically integrated firms handled every step of a product, from initial design to final sale. Now, a small army of specialist firms focus on narrow portions of technology, using intellectual-

property rights to protect their inventions when they are licensed out.

Second, as many new technologies quickly turn into commodities, firms increasingly rely on innovation to remain competitive. Yet the return on investment in R&D is short-lived because more people innovate at a far faster pace than before. That means margins have shrivelled, explains Ragu Gurumurthy of Adventis, an IT and telecoms consultancy. "How to recoup the cost of innovation? By licensing the technology," he says.

Third, customers are demanding "interoperability" and common standards rather than proprietary systems, which means different firms' technologies must work together smoothly. This often requires pooling patents or cross-licensing agreements.

Fourth, generating intellectual property is less capital-intensive than other aspects of the IT businesses because it relies mainly on people rather than bricks, mortar and machinery. That makes it attractive to many start-up firms. Venture capitalists often demand that firms patent technology, both to block rivals and to have assets to sell in case the firm flounders. This was particularly apparent during the internet boom in 2000. "In addition to the dotcom bubble, we had a patent bubble," says Mark Webbink of Red Hat, a firm that sells Linux, an open-source operating system.

Companies cannot simply turn their back on what is happening in intellectual property. Even if they refuse to play the game, they may be unwittingly infringing someone else's patents because there are so many more of them around. Unless firms have patents of their own to assert so they can reach a cross-licensing agreement (often with money changing hands too), they will be in trouble. Thus many companies are acquiring large numbers of pat-

ents for purely defensive reasons, for use only to keep others' patent threats at bay.

Legally, the intellectual-property system covers four areas: copyrights (used to protect artistic, musical or literary works); trademarks (for things like brands); patents (for inventions); and an ill-defined category of "trade secrets", for practices that are kept confidential. The system provides legal protection against counterfeiters and copiers and is vital to many fields, such as biotechnology and nanotechnology. And it matters not only to companies: universities, too, have recently become big patent holders and licensors.

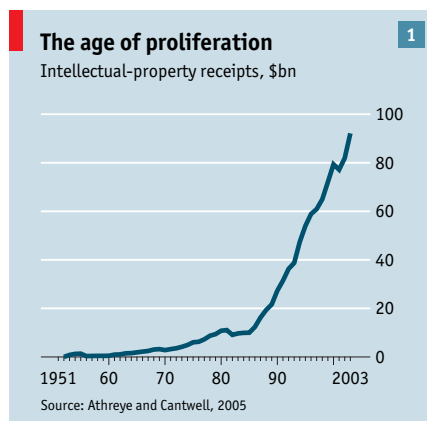
In IT and telecoms, the area of intellectual property that is creating particular upheaval is patents (see box, next page). This is because patents confer a "negative right" to exclude others from using the same technique; yet information technology and telecommunications rely on "network effects", meaning that as more people use a system, it becomes that much more useful. To make the most of such network effects, interoperability between different technologies is essential. This can be achieved either by a single standard set by a dominant firm (which tends to generate resistance from customers and competitors), or by using a mixture of different technologies, with the patent system providing legal protection for inventions.

#### The more the merrier

As the system of intellectual property evolves, the ethos seems to be that if a little is good, then more is better. That is to say, if some property rights on inventions are beneficial, then increasing those rights—in scope, strength or duration—will increase the benefits. But that is a large assumption. There is even a body of evidence to suggest it is flatly wrong.

The technology industry faces the question of whether today's abundance of patents, rather than lubricating the gears of innovation, may be clogging them up. Already, businesses are having to negotiate with other firms in order to do basic things such as reading files from different proprietary formats; and the design of new technology products now involves lawyers as well as engineers. The proliferation of patents might prove a serious encumbrance to businesses, just as travellers along the Rhine in medieval Europe were slowed down by having to pay a toll at every castle.

James Boyle, a legal scholar at Duke Law School in North Carolina, claims that the current increase in intellectual-prop- ▶▶



erty rights represents nothing less than a second “enclosure movement”. In the first enclosures, in 18th- and 19th-century Britain, the commons—open fields used by many, belonging to all, owned by none—were fenced in, and nearly all land became private property. By analogy, the granting of property rights on ideas, to the extent it is happening today, is plundering the intellectual commons of our public domain.

Others see the expansion of intellectual-property rights as hugely beneficial, leading not only to more innovation but to

more openness. The standard justification for the patent system is that it provides an incentive for innovation, allowing the inventor to reap rewards by protecting the work from imitators who would otherwise hitch a free ride on the investment. But that is a simplification. The initial intention was in fact to make inventions available to the public as well.

Before the 18th century, innovations were mainly kept secret through trade guilds. Sometimes monarchs capriciously granted indefinite exclusive rights to some-

one they favoured. Intellectual-property law was meant to remedy this by requiring the invention to be vetted by experts, limiting the right to a set period and making knowledge more widely accessible through public disclosure. Its development was part of the drive towards democracy and capitalism and the abolition of royal privileges and monopolies.

In principle, patents open up innovations in two ways. First, they confer only temporary rights; once patents expire or are abandoned, the intellectual property

## Patent sense

THE first modern patent law was introduced in Venice in 1474 to attract skilled merchants to the city-state. Anyone who came up with a technique deemed novel was given a ten-year right to its exclusive use; infringers were fined 100 ducats.

These days, patents are granted on a national basis after close scrutiny by government patent offices. The laws differ in detail, but the main points are similar (thanks to intergovernmental treaties). Generally, the technology to be patented must pass four tests: that it is novel, useful, non-obvious and man-made. A mere discovery of a natural phenomenon would not qualify. A patent confers the right to exclude others from using an invention for around 20 years.

Patents are enforceable only in the jurisdiction that grants them, so a patent awarded in America, for instance, is valid only in that country. But as the country with the world’s largest economy, America in some respects acts as the world’s patent office; around half of all patents there are awarded to foreign applicants. The cost of applying for a patent in America is around \$2,000, but the legal fees for preparing it can easily run to \$35,000. Applicants also have to find around \$7,000 in renewal fees. Once the patent has expired, the technology enters the public domain and can be used freely.

The three main patent offices, accounting for nearly 90% of the world’s patents, are in America, Europe and Japan. A European patent does not confer the right to enforce it in all EU countries, only those

that are requested, and for which an official translation into that language is made. Since patent disputes can hinge on the meaning of a single word, and some applications can be hundreds of pages long, this is a cumbersome rule. Attempts over three decades to establish an EU-wide patent have been blocked because of bickering over what the legal languages should be.

Software was unpatentable until 1981, when an American court changed the rule. Likewise, an American court in 1998 allowed “business methods” to be patented, which brought a torrent of applications. Europe has resisted patents on business methods, and closely scrutinises software patents. A proposed EU directive to harmonise software patents was scuttled in July after protests from open-source advocates.

As time has gone on, the patent system

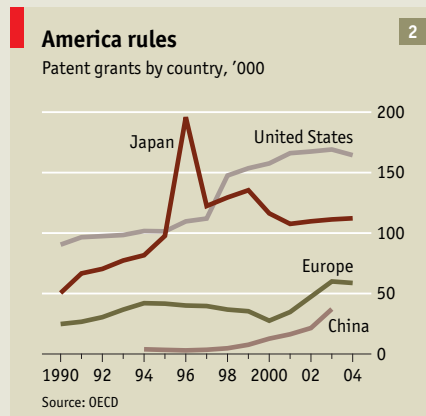
## How the system works

has accumulated a number of problems that will have to be resolved before it can operate effectively. For example, the number of applications has roughly doubled in the past decade, so patent offices are swamped. This means it now takes around three years to decide on an application, which has created a backlog of around 500,000. If nothing is done, that figure will double by 2010.

Experts also claim that the quality of patents—measured by whether the invention is truly new and meets its claims—is deteriorating. This can cause trouble if the holder uses a “junk” patent to extract royalties from others on things that ought be in the public domain. Litigation is already becoming more frequent and more costly.

To improve matters, America is considering legislation that would specify a period after the granting of a patent during which it can be challenged. It would also increase the funding of the patent office to hire more examiners with greater expertise. Controversially, it would bring America in line with most other countries by changing the criterion for a successful application from “first to invent” to “first to file”. Small inventors oppose this, but companies prefer it because it provides greater legal certainty.

For the longer term, there is talk about harmonising patent policy worldwide, which would be good for global business. Meanwhile, competition regulators have begun taking an interest in patents. They see them as a commercial weapon that could violate antitrust law. Offenders can expect penalties exceeding 100 ducats.



▶ they are designed to protect passes into the public domain. Second, they require the details of the invention to be disclosed so they can be replicated. This permits follow-on innovation, which is essential for industrial progress.

More recently, as the patent system has evolved, it has been seen to provide other benefits. It leads to a degree of economic specialisation that makes business more efficient. Patents are transferable assets, and by the early 20th century they had made it possible to separate the person who makes an invention from the one who commercialises it. This recognised the fact that someone who is good at coming up with ideas is not necessarily the best person to bring those ideas to market.

Such specialisation is now so common that it is taken for granted. Semiconductors, the silicon chips that power digital devices, are typically designed by specialist firms that are good at engineering, but physically produced by other firms whose expertise lies in manufacturing. As the patent system has matured and licensing has become much more widespread, these transfers are turning business relationships on their head. Some economists argue that the growth of patent transactions is establishing a proper "market for technology". The creation of any market takes time and trouble. When such an institution develops, those outside the system

feel threatened by it and condemn it. Yet just as the banking system created a market for capital and the insurance industry created a market for risk, the growth of the patent system may be creating a market for innovation.

This provides a sort of "liquidity" to knowledge that did not previously exist, argue Ashish Arora, Andrea Fosfuri and Alfonso Gambardella in their 2001 book, "Markets for Technology, the Economics of Innovation and Corporate Strategy". Seen that way, the evolution of the patent system in IT and telecoms is simply part of a broader movement to create an institutional mechanism for the transfer of ideas to fuel economic progress.

#### Mutually assured destruction

That is the context in which commercial battles are taking place in the technology industry today. The convergence of IT and telecoms is forcing companies to work together in new ways in order both to protect and exchange their technology. "How do you create a marketplace for ideas in that converged marketplace?" asks David Kafer, director of intellectual-property licensing at Microsoft. "That is really the big question. In the past, two parties would haggle over a pound of wheat. Today, they haggle over the patent of the week."

These markets for technology are expanding. For instance, 60% of technology

and telecoms firms report an increase in licensing compared with the previous decade, and 70% report fewer obstacles to reaching such agreements, according to a survey by the Organisation for Economic Co-operation and Development in 2004. "Intellectual property is the next asset class. Companies are creating a market," says Eric Gillespie, the co-founder of iPro, one of the new crop of firms that are fuelling patent transactions.

But when talking to executives in the technology firms themselves, the language you hear most often is that of "the arms race" and "mutually assured destruction". Companies amass patents as much to defend themselves against attacks by their competitors as to protect their inventions. Many technology companies have recently championed reform of the patent system to deal with spuriously awarded patents, licensing extortion and massive lawsuits. "There is a broad recognition in the US that the patent system, if not reformed, will...begin to impede American competitiveness around the world," says Bruce Sewell, general counsel of Intel, the world's biggest chipmaker.

This survey will argue that, despite such adjustment problems, the huge changes in intellectual property currently taking place in the IT sector will in time produce more efficient markets. But what do the IT firms themselves make of it all? ■

## The arms race

Companies are preparing for the intellectual-property battle

AS A 23-year-old engineer working for Hewlett-Packard in 1975, Joe Beyer had a clever idea. The new desktop computers, he thought, should be able to work on more than one task at a time (something that at that point only much bigger computers could do), rather than forcing users to twiddle their thumbs as they waited for new applications to launch. After many late nights in the lab, he devised a way to make it happen, and duly had a patent granted on his invention—his first of many. Yet within a few years, all computer-makers were using the same technique.

Mr Beyer told Bill Hewlett and Dave Packard, the company's founders, that the idea was being copied, and tried to persuade them to enforce the patent. But both said no; the firm was benefiting from the

invention in its own products, and that was enough. "I was disappointed," says Mr Beyer. "I thought it was a very valuable patent, and HP deserved some value from it. I put it aside and moved on. But in the back of my mind, I felt that we had not done enough to get the full value of it."

Times change, and so did Mr Beyer's role in the company. Thirty years on, he now manages a team of 50 people in HP's intellectual-property division. When he meets the boss, it is to report on the group's patenting and licensing business, an area where engineers and lawyers work hand in glove. Since the unit was created in 2002, HP's licensing revenue has increased from \$50m to over \$200m. "It represents a fairly dramatic shift in how HP treats IP," Mr Beyer concedes.

The changes at HP are mirrored throughout the technology sector. Companies are now treating intellectual property as a business asset not very different from a product on a shelf. They are spending more on R&D, filing for more patents and licensing out their ideas, as well as licensing in other people's. They are also increasingly asserting their patents against others, demanding royalties and going to court to get them. "We are in the middle of an explosion in the use of IP to try to protect market positions," says Intel's Mr Sewell.

The biggest reason for relying more heavily on intellectual property is that other firms are doing the same. Most companies readily admit to the drawbacks. It can make it tougher to build new products without accidentally infringing someone ▶▶

▶ else's patents, as well as increasing costs and sometimes leading to spurious lawsuits. Yet technology executives insist they must harness the system lest they be crushed by it. Pressed on why his company is pushing to obtain more and wider patents, Henning Kagermann, the boss of SAP, a large German software firm, exclaims in exasperation: "These are the rules of the game!"

"There is certainly a level of mutually assured destruction among the big companies. If you build up your patent portfolio, I build up mine—nukes pointing at each other," says Mr Papadopoulos at Sun Microsystems. But he sees it as an advantage rather than a problem. "That has exactly the right outcome. We sit here and exchange patents with each other. Ultimately, that's great: you have a set of companies doing more innovation than they would have otherwise," he says.

Those inventions increasingly get turned into property rights. For example, Nokia has over 12,000 existing patents globally, and 10,000 innovations in the process of being patented. It files around 1,500 applications a year. IBM has around 40,000 patents and is granted 3,000 more every year, which has made it the number one recipient at America's patent office for the past 12 years. HP last year ranked fourth in America, with 1,783 patents; worldwide, it holds around 25,000. Microsoft has recently sprinted into the market, with around 10,000 applications pending.

Patents have grown in parallel with an increase in spending on research and development. One rule of thumb is that tech companies file almost two patents for every \$1m they spend on R&D. The likelihood that research will yield a patent has increased hugely, thanks in good part to

the growth in software patents. According to a 2004 study by James Bessen, a researcher at Boston University's School of Law, and Robert Hunt, an economist at the Federal Reserve Bank of Philadelphia, by the end of the 1990s firms were able to obtain more than twice as many software patents for every R&D dollar they spent than at the start of the decade.

Messrs Bessen and Hunt find it worrying that the growth in the number of patents exceeds the increase in R&D expenditure. They believe it indicates that these are "cheap" patents being used as a substitute for more R&D. In other words, the cake is not getting much bigger, it is merely being cut into more and ever thinner slices. Is the industry doing too much patenting merely for the sake of it?

"We have 10,000 patents—it's an awful lot of patents," says Mr Sewell at Intel. "Would I be happy with 1,000 patents rather than 10,000? Yes, provided the rest of the world did the same thing." John Kelly, who directs IBM's intellectual-property strategy, explains that: "Even though we have 3,000 patents [awarded annually in America], if we had to, I could make that number 10,000."

Despite this proliferation, numerous economic studies show that only about 5% of patents end up having any value, and that a small handful of those account for most of the income received from patents. Moreover, according to a study by America's National Bureau for Economic Research in 2000, patents were less effective in protecting innovation than things like secrecy, speed to market and complementary manufacturing, sales or service.

With firms acquiring more patent ammunition each year, what if someone were to pull the trigger? "Should one com-

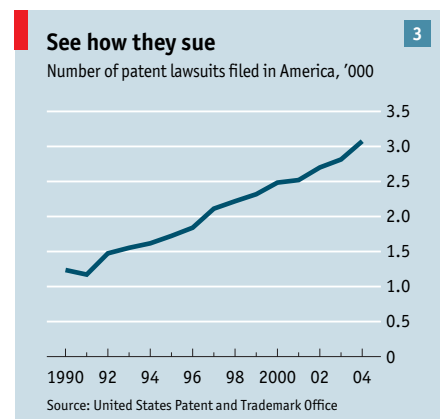
pany use its portfolio against another, it faces potential retaliation. The best that can happen is nothing happens," says Joe LaSala, general counsel of Novell, a software company that sells proprietary applications along with the open-source Linux operating system.

With the plethora of patents swishing around the system, it is impossible to avoid potential infringement, so self-defence becomes imperative. One former executive at a search-engine company says that all the major search firms—Google, Yahoo! and MSN—actually infringe each other's patents in some way. Their intellectual-property strategies are designed to ensure a balance of power. The same is true in nearly all other areas of IT and telecoms. Everyone has an interest in preserving this precarious equilibrium lest the whole edifice come crashing down.

**Pure intellect**

Qualcomm is the very model of an intellectual-property company. Where many companies line their walls with pictures of their products, in the firm's San Diego headquarters the corridors are covered with plaques of its patents. Qualcomm created a technology called CDMA, which now forms the basis of third-generation wireless networks. Around one-third of the company's revenues (and 60% of its profits) come from royalties on all equipment that uses the technology; the remainder comes from selling the chips that rely on that intellectual property, where it has a market share of over 80%.

Because its technology underlies the third-generation mobile-phone standard, Qualcomm has become a toll bridge that all equipment-makers must cross. "Our licensees don't like to pay us royalties, but they forget the work we put in to get the business. We provide them with quite a bit ▶▶



▶ more than a patent licence,” explains Steve Altman, Qualcomm’s president. “If we were just an IP shop, we would not have been successful. What caused us to be a success was that very early on we didn’t just license patents, we enabled the manufacturers to get to market quickly.”

The licensing practice began when Qualcomm was young and struggling in the early 1990s, helping its cashflow. At first, the company made the mobile phones as well as developing the underlying technology, but in 1999 it sold its handset division in order to focus on the less tangible—and more lucrative—part of the business. Today, it spends almost \$1 billion a year, or 19% of revenue, on R&D. It has amassed 1,800 patents, and 2,200 applications pending.

“We could have very easily said, ‘Let’s close up shop, sit back and wait for royalties to come’. But that would have been a short-lived business: the technology evolves very quickly,” says Mr Altman. In

August, Qualcomm paid \$600m for Flarion, a firm with little revenue but around 100 patents either issued or pending on a new generation of wireless technology. If all goes as planned, this will allow Qualcomm to dominate the next phase of high-speed mobile communications too.

“IP companies can be very profitable. That doesn’t mean we are extortionists by any means. If you get the technology right, you get to license it many times,” explains Tudor Brown of ARM, a British firm that creates the intellectual property behind microchips used in nearly all mobile phones and other wireless devices. ARM is the most ubiquitous company no one has ever heard of, with its technology in use in over 70% of all mobile phones. Whereas Qualcomm still keeps a foothold in the physical world by supplying chips, ARM does nothing but R&D and licensing.

But Mr Tudor has a warning for firms that want to concentrate exclusively on the intellectual-property business: licensing

usually works only alongside a basket of products or services. For IBM, for example, the majority of its intellectual-property revenue comes from the sale of know-how, not patent licences alone. In essence, the difference is that between the recipe for a dish and a list of ingredients.

ARM was fortunate to be in the right place at the right time, when numerous chip-design firms all wanted to outsource the basic technology for wireless chips so they could innovate on top of it. Also, ARM understood that it needed to offer a lot more than just patent licences, such as documentation and support for its licensees. “They are successful only if they get it right, and we are here to help them get it right,” Mr Tudor says.

Yet it is easy to get it wrong. Take BT, Britain’s telecoms incumbent, which in 2000 announced that it had a patent on hyperlinks, a technology that allows people to click on a web-page link to go to another web address. BT claimed it had de- ▶▶

## Voracious venture

WHEN visitors walk into the headquarters of Intellectual Ventures, they come face to face with the full-size head of a *Tyrannosaurus rex*—the special-effects model used in the film “Jurassic Park II”. Is that a hint that the company wants to eat IT companies alive?

Nathan Myhrvold, its founder, thinks not. He is excited about the company’s strategy, which he describes as “an experiment”. Intellectual Ventures represents a radically new business model for technology—a cross between a venture-capital fund, a law firm and an R&D lab. It wants to finance inventors to do what they do best—invent—and obtain patents on those technologies. Then it wants to license those innovations to the world (and pursue infringers with razor-fanged determination). The IT industry is terrified of it.

The main reason to take Intellectual Ventures seriously is Mr Myhrvold himself. After selling his software company to Microsoft in 1986, he spent the next 14 years as the company’s top techie. He is naturally brainy, entering university at 14 and getting a doctorate at 23, then doing physics with Stephen Hawking at Cam-

bridge. He left Microsoft worth hundreds of millions of dollars, and turned his talents to promoting innovation (as well as funding dinosaur excavations).

In his view, the world has an archaic idea of patents: that they are worth something only when they come with a product. It reminds him of the businessmen in the 1980s who insisted there was no money in software because people would buy only something they could see, ie, the computer itself.

His business model for his new venture is precisely the same as the one he got to know at Microsoft: come up with a technology so pervasive that no one can avoid paying for it. The difference is that Microsoft tried to operate a monopoly the government sought to make illegal; Intellectual Ventures proposes to make use of the government-granted legal monopoly conferred by a patent.

Intellectual Ventures expects shortly to be granted its first patent, related to digital imaging, and has hundreds of applications pending. But in the meantime the company has been delving into its huge bank account—rumoured to exceed

## A new intellectual-property business model

\$300m, from backers that include Microsoft, Nokia and Sony—to purchase heaps of patents up for sale. It has not asserted any patents yet, but many think it is just circling before devouring its prey.

### Trolling for business

There have recently been complaints in the industry about “patent trolls”—patent holders that send letters asking IT companies either to pay royalties or face a long, costly lawsuit. Is Mr Myhrvold not the biggest troll of all? He smiles at the question. By funding invention only, he says, even with the cost of licensing it, his firm will provide society with more innovations than it would otherwise have had. In that sense, Intellectual Ventures may be creating a market for inventions that marks a new phase of capitalism. Already a gaggle of firms with fancy names such as iPotential, ipValue, Yet2.com and ThinkFire are making a business of patent transactions, and hedge funds are acquiring patent portfolios. One day, Mr Myhrvold says, the dichotomy between physical products and intellectual property will become extinct.

▶ developed this innovation more than a decade earlier, before the web even existed. Its executives whispered that it was worth billions. The company sent out menacing letters to firms, seeking to enforce its “rights”. But an American judge laughed its claims out of court.

Mr Beyer at HP says he also gets many demands to pay up for infringing someone else’s patents. But he is often able to show that the accusers are themselves infringing HP patents, and occasionally ends up getting them to pay him instead.

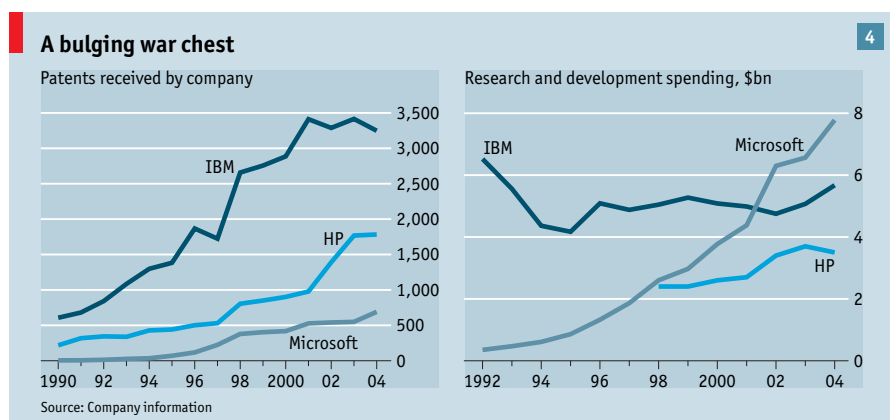
**The Microsoft factor**

One of the newest entrants to the intellectual-property game is also the most feared: Microsoft. In the past two years, the company has reshaped its entire strategy around innovation and patents. This will have serious consequences for the rest of the industry.

In 2003, Bill Gates, Microsoft’s founder and chairman, faced a number of problems that centred around intellectual property. First, the company found it was being sued for patent infringement more often and had to pay hundreds of millions of dollars in damages. Second, antitrust regulators were forcing Microsoft to open its technology to rivals to allow different systems to work together. Third, the company recognised that its monopoly on its operating system and desktop software would be eroded over time, in part by open-source alternatives, and wanted to delay that process. Lastly, Microsoft was spending around \$5 billion a year on R&D and wanted some revenue to help offset that outlay.

Mr Gates summoned the father of IT patent licensing, Marshall Phelps, a cheerful lawyer in his 60s who had recently retired after 28 years with IBM, where he set up and ran the company’s highly regarded licensing programme. Mr Phelps told Mr Gates that he had three options: keep the firm’s intellectual property within the company to use in its products but make no ancillary revenue from it; assert the company’s patents against others (and face the wrath of regulators and rivals); or license it. In June 2003, Mr Gates plucked Mr Phelps out of retirement; by December, Microsoft’s intellectual-property licensing division was born.

Since then, in addition to offering technology to other firms, Microsoft has struck a score of cross-licensing deals with big companies. Last May the company started a new business unit, Microsoft Intellectual Property Ventures, to license technol-



ogy—in areas such as graphics, security and databases—to venture capitalists and start-up firms, sometimes in return for stakes in the companies. That is a new departure: in the past, Microsoft has tried to “cut off the air supply” of rivals, in the celebrated phrase of one Microsoft executive.

Microsoft is coming quite late to the patent game, for the obvious reason that it enjoyed a monopoly in its business area (albeit one judged illegal) for a long time and had little need of patents to protect it. Software copyrights and trade secrets sufficed.

The change in the company’s strategy mirrors the wider shifts taking place in the industry as a whole. In 1976, Bill Gates wrote an “open letter to hobbyists”, asking people not to copy the firm’s software illegally but to pay for it instead, because that would enable him to fund further improvements in the product. At the time, software was protected by copyright, which automatically comes with any creative work; software patents started to be allowed only in the 1980s, but were rarely sought. When they were first introduced, Mr Gates did not think much of them. In 1991, he wrote in a company-wide memo:

If people had understood how patents would be granted when most of today’s ideas were invented and had taken out patents, the industry would be at a complete standstill today...A future start-up with no patents of its own will be forced to pay whatever price the giants choose to impose.

What changed, explains Mr Kaefer of Microsoft, was the need to make the technology more open to others, to share it and to interconnect with other firms’ technology. “Software patents take the place of trade secrets that we relied on before,” he says. “Software is built on the shoulders of giants—no one can build the whole thing. Patents are a property right that allow the

innovation to be exchanged.”

However, there is a controversial side to Microsoft’s intellectual-property ambitions. Since 2003, the company has claimed patents on some basic aspects of information technology that many computer scientists say are well established already and should be open to all, such as the “file allocation table” system that computers use to manage files. It has also asserted rights over file formats and so-called “application programming interfaces” that let different types of software interact. These things, critics argue, are not truly intellectual property but merely translations to allow interoperability. Moreover, Microsoft has used its recent multi-billion-dollar antitrust settlements with AOL, Sun, Novell and others to strike broad cross-licensing agreements, thus neutralising potential patent foes.

Taken together, Microsoft seems to be preparing to use its intellectual property as a way to demand a sort of “interconnection fee” from competitors so that their software can interact with Microsoft’s (in the same way as a dominant telecoms operator uses interconnection to its network to thwart rivals). The company, suggest the critics, is simply trading its illegal monopoly for a legal one.

No wonder that Microsoft is strongly resisting a requirement by the European Union’s antitrust regulators to disclose its networking protocols, which enable different software to interact, arguing that it should be compensated for its intellectual property. This, in particular, hurts open-source software developers, who lack the formal corporate structure (and funds) to license the code. This summer Microsoft took the EU to court over the matter.

In fact, the chief challenge to the company comes from open-source software, whose supporters insist that innovations ▶▶

▶ should be shared, not kept proprietary. Mr Gates calls them “new, modern-day sort of communists” who “don’t think that those [intellectual-property] incentives should exist.” And Microsoft has trumpeted that it will indemnify its users against potential patent-infringement liability—which is clearly meant to show up open-source software, where some infringement cases have been brought.

All in all, it looks as though Microsoft is preparing to use intellectual property as a new competitive weapon. Last year, Mr Gates told financial analysts that the firm would increase its patent filings to around 3,000 in 2005, up from 2,000 the year before and the low hundreds in the 1990s.

The company currently holds over 6,000 patents, and has around 10,000 applications pending.

At the same time, Microsoft is among the companies most frequently sued for patent infringement: it is currently involved in 32 patent disputes, and spends close to \$100m a year in legal costs. Conversely, in the area of copyright, Microsoft’s software is the most pirated in the world, causing billions of dollars of potentially lost sales each year.

Industry-wide, there is a danger that big technology firms’ infatuation with intellectual property may cause them to exploit their dominant role, forcing smaller firms to pay up or go under. If that

happened, only the biggest companies with stacks of patents could hope to survive comfortably. Smaller companies would have to start taking out ever more patents to defend their interests.

To critics of the patent system, this is a sign that the pendulum has swung too far in favour of intellectual-property owners, resulting in an inefficient market for technology. There have been calls for legal reforms and changes in business culture in favour of a more balanced and open approach. But in fact these changes are already taking place—and the impetus is coming not from policymakers or lawyers, but from within the technology industry and from the marketplace itself. ■

## An open secret

Sharing intellectual property can be more profitable than keeping it to yourself

ON JANUARY 11th this year, America’s patent office reported that IBM had earned the top spot in its annual patent ranking for the 12th time in succession, earning 3,248 patents in 2004. On the same day, at the firm’s headquarters in Armonk, New York, IBM did something unusual: it pledged 500 of its existing software patents to the open-source community, to be placed into a patent “commons” that allows open-source software developers to use the innovations and build upon them without risk of infringement. Why would a firm that cares so much about intellectual property want to give it away?

“It isn’t because we are nice guys,” explains Mr Kelly, the head of the company’s intellectual-property division. The company’s motive, he says, is fear that patent rights have swung so far towards protection that they risk undermining innovation. The patent commons is meant to help restore the balance. “If this balance goes too far in one direction or another, this industry will not survive and our company will not survive. It is really that fundamental to us,” Mr Kelly says.

Since then, some other companies have taken similar initiatives. In May, Nokia said it would not assert its patents against the inner code of Linux, a popular open-source computer operating system. In June, Red Hat, a big Linux distributor, said that it, too, would contribute to a patent commons. In September, Computer Associates donated 14 patents for free use by the

open-source community. Open Source Development Labs, an industry forum, has offered to act as a repository for patent-commons projects.

Even Sun Microsystems, for years the epitome of a proprietary company, with specially designed semiconductors and software that work on its machines, announced a change in approach. Threatened by the pincer movement of commodity computer chips inside machines and

Linux software running on them, it made its Solaris operating system open-source.

The trend towards open software code is an example of a bigger development in the technology industry: a new approach towards collaboration and “open innovation” that at times seems to work around the traditional intellectual-property system, and at times is directly fostered by it. “People think this is all a sort of flaky, radical, pinko strategy not related to the com- ▶▶

petitive marketplace. *Au contraire!* This is about how to kill your competitor,” says Don Tapscott, a management expert who studies innovation. “And you kill your competitor these days by identifying the need to innovate yourself, but also opening up that innovation; by owning IP, but also sharing IP.”

**Sprats and mackerels**

How do IBM, Sun and others make money on open-source? The answer varies from company to company, but has to do with standards, interfaces and something the techies call “ecosystems” (that is, a community of third-party developers and service businesses that contribute to, and enhance the value of, the underlying product). “Instead of having a closed proprietary system, this is a way of opening the development environment to a larger community,” says Auli Luukkanen-Lääperi, who heads Nokia’s intellectual-property strategy. She says this benefits the company’s R&D efforts and translates into more sales, because the firm’s mobile phones become more useful to customers.

IBM profits from open-source (and particularly Linux) in two ways. First, open-source software is by some measures less expensive than proprietary software, so using it lowers the overall cost a customer pays for IBM’s computers, applications or services. Second, it provides a common platform on top of which IBM can build and sell special applications and services.

Because open-source is non-proprietary, customers are much less locked into the firm supplying the IT systems. Its interfaces are open. Software interfaces are the digital equivalent of plugs and sockets. They require little intellectual endeavour, but are treated as intellectual property to keep rivals out. Opening up an interface means new software can easily be written to plug into it, increasing its value to users.

By giving up proprietary lock-in, firms can reap the advantages of open-source that accrue not just to one company but to all firms industry-wide. They can sell software that works on Linux, and they can count on a far wider ecosystem of developers and service companies to improve the software that benefits both them and their customers. For example, Apache, an open-source application, dominates the market for web-server software.

For Sun, opening Solaris was a way to attract independent developers to the platform, which opens it up to innovation from a broader community. Without this sort of ecosystem, the firm itself would be

responsible for all enhancements to the product. That would make it not only slower and more costly but probably also less innovative than Linux, with which it competes in certain areas.

The best analogy is the internet. As late as the mid-1990s, a number of different networking standards were vying to become the world’s infrastructure for data communications. One, called x.25, was used by most telecoms operators and many businesses, including France Telecom with its 9m Minitel terminals. The internet won out because its underlying standards are open and non-proprietary. This kept the cost low, made the system open to improvements and attracted a large development community. And once it was established, it benefited from network effects: the more people that use it, the more valuable it becomes to everyone, and the more others want to use it too.

The internet’s ecosystem includes everyone from Cisco and Dell to eBay and Amazon. For instance, Cisco, which makes communications equipment, forgoes royalties on the use of any patent that relates to an industry standard, so as to foster the industry’s overall growth, explains Mark Chandler, its general counsel. In return, it hopes to get more sales. Firms such as Cisco, Juniper, Alcatel and others can compete and innovate on top of the internet’s open standards, just as two companies making toasters can compete in myriad ways but not on the size of the electrical plug or the voltage, which are based on well-established interfaces and standards.

Open-source software takes a novel approach to intellectual property. Although much is made of it being “free”, in fact it relies heavily on intellectual-property rights, but through copyright and strict licensing

terms. The terms generally stipulate that any improvements must be made available to all—though there is no reliable way to enforce this, other than fostering the right kind of culture.

The patent system can be deadly to open-source. It could even block techniques that try to work around a patent, making users legally liable if they use open-source. Indeed, this is precisely why big IT firms are pledging their patents to the open-source community. It is to provide open-source developers with a war chest to fend off patent disputes, by giving them rights of their own to assert (though nobody is sure whether this will work).

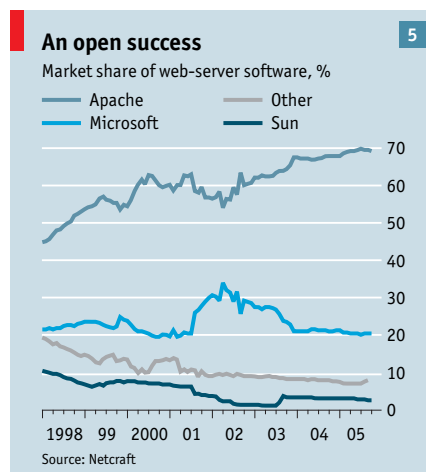
**Free as a bird**

Some members of the open-source community are vehemently opposed to the current system of intellectual property. This movement traces its origins to Richard Stallman, a software engineer who in the 1980s championed a concept called “copyleft”, in protest at the copyrighting of software. He believes software should be as free to use as the Bible, and free to modify, too. This does not mean it should necessarily come without a cost—“free as in free speech, not free beer,” Mr Stallman is fond of saying—but it should be open to developers to tinker with.

Today, a small army of activists is carrying the torch, with names such as Electronic Frontier Foundation, Creative Commons, IP Watch, Public Patent Foundation, Centre for the Public Domain, the Open Knowledge Foundation and the Foundation for a Free Information Infrastructure, which was instrumental in blocking a European Union directive to harmonise software-patent policy this summer.

But the companies that sell open-source software have a different take. “We don’t subscribe to the view of some of our friends in the open-source world that IP is bad and hamstring innovation. The patent system is very necessary,” explains Mr LaSala of Novell, a large Linux distributor that sells its own proprietary software riding on top of the operating system. Still, the company is well aware of the problem: last December Novell paid over \$15m to buy a handful of important e-commerce patents in a dotcom bankruptcy auction, simply to make certain that they are not used against the firm or indeed the industry at large.

For some proprietary technology companies, on the other hand, open-source poses a serious threat. Sun, for instance, essentially opened up to save its business, and the outcome remains uncertain. ▶▶



erty. It refuses to license its “protocols,” the interfaces that let open-source products interact with Microsoft; it suggests that open-source software may violate patents and copyrights; and it makes sure everyone knows that its own products, being from a single, known supplier, are entirely above suspicion. Second, Microsoft has adopted some open-source practices, disclosing its source code to large customers. It also opens the programming code of operating systems in which it does not have a dominant position (such as for hand-held devices) to third-party developers.

#### Let's do it together

Open-source software is not just a new way of treating intellectual property in the IT industry, but a new way of working together as well. Among its most distinctive traits, says Mark Blaxill of the Boston Consulting Group, is its decentralised form of collaboration. It breaks complex tasks down into modular bits, which are worked on by specialists through a clever form of self-organisation (made possible by the internet), and are then reassembled.

Steven Weber, a political scientist at Berkeley and author of “The Success of Open Source”, published last year, thinks this form of economic production has a promising future. The rise of open-source is coming at a time when companies are already managing their intellectual property in ways that are more amenable to sharing than they used to be.

One reason is growing complexity. As firms add more features to their products to keep them competitive, they often need to make use of innovations developed by other companies. And as different compa-

nies need to make their IT systems work together to take part in global supply chains, the different kinds of software they are using have to interact seamlessly.

Another reason is convergence. When France Telecom decided to work on multimedia applications with a view to offering television over phone lines, Microsoft was interested too, because it wanted to understand the needs of that market. In May the two firms announced they would develop products jointly and share the intellectual property they would create.

A third reason is the disaggregation into niche firms at the leading edge of the IT sector, and a specialisation that is economically efficient. As this happens, software and components are becoming more modular and interchangeable.

“You see people innovating and creating new ideas and technologies, but not taking them all the way through to the market. They carry it to a certain stage and then hand the baton on to others who bring it on to commercialisation,” says Henry Chesbrough of the Haas School of Business at the University of California, Berkeley. “The patent system is key to engaging in this kind of innovative division of labour.”

This explains the paradox that as today's technology firms acquire more rights to exclude others, in the form of patents, they also feel a greater need to share. They are not doing this for philanthropic reasons, but because intellectual property is so fundamental to their business. As Mr Kelly of IBM puts it: “IP will still be the cornerstone of the successful companies in our industry.” Many more patent pledges, he says, are on the way. ■

- ▶ Novell realised that its long-standing proprietary applications would be more valuable atop Linux, so it overhauled its strategy around open-source.

But the biggest threat posed by open-source is to Microsoft. That company has been successful not only because its software is on almost every personal computer in the world, but also because it has brilliantly nurtured a vast community of developers who write applications on top of the firm's Windows platform. This ecosystem enhances its value. Open-source is offering an alternative, common platform for developers to write applications.

Microsoft has responded with a two-pronged strategy. First, it tries to block open-source by using intellectual prop-

## Thinking for themselves

India and China aim to challenge western tech firms through innovation, not just cheap labour

ON THE sixth floor of the sleek headquarters of Sasken Communication Technologies in Bangalore, India, a small cubicle serves as an office for the chief executive, Rajiv Mody. There, hanging on a wall beside a photograph of Mahatma Gandhi, is a plaque of patent number 5,072,402, for a “Routing System and Method for Integrated Circuits”, granted to Mr Mody by America's patent office.

Sasken, a publicly traded firm with \$55m in revenue and over 2,400 employ-

ees, writes the code that is embedded deep inside the hardware of telecoms equipment, from mobile phones to high-speed internet modems. The patent on the wall is a visible sign that the company, like India itself, is trying to shift from low-end work to more sophisticated technologies, complete with home-grown inventions. The same thing is happening in China. And both countries are using the intellectual-property system to stake out their turf.

For the moment, both are better known

as places where intellectual property needs special protection. As a strategy for economic development, nabbing someone else's patents is nothing new. Immediately after America's declaration of independence, its government made it official policy to steal inventions from Europe, expediting the country's rise as an industrial power in the 19th century, notes Doron Ben-Atar of Fordham University in New York. Yet in India and China, the pressure for respecting intellectual property more is ▶▶

▶ now beginning to come from domestic businesses.

It will be a long, uncomfortable process, but again there are precedents. Japan, Taiwan and South Korea, which started off by competing mainly on cheap labour, ended up challenging the West's biggest technology companies. Taiwan now makes the vast majority of the world's computer components, and its companies own a plethora of patents. South Korea's Samsung became one of the top ten recipients of patents granted by America's patent office in the 1990s, and still is. Japan earns the largest number of patents at the same office after America itself (although this is partly because Japanese firms traditionally file large numbers of patents with very narrow claims).

The rise of China and India has mainly been underwritten by foreign companies, not indigenous ones, though this is starting to change. Both countries have been good at persuading firms setting up operations there to invest in training locals. Today, nearly all the large IT firms have big research centres in both countries, and local companies understand the need to develop their own intellectual property. Local people who went to Silicon Valley to find fortune are now starting up their own businesses in their home countries. Foreign venture capital is pouring in.

Without home-grown technology, India and China have to depend on foreign firms, and they do not like it. China, in particular, has seen a surge in the royalties it is paying to foreign firms, and is trying to stem the flow. When Qualcomm's boss went to China in 2001 to negotiate royalty payments for his company's third-generation mobile-phone standard, he agreed to accept less than what he charges others. Within a year, China was working on developing its own 3G wireless standard. If it succeeds, Qualcomm will see its royalties shrink further.

China and India have more to offer than just low costs, although these are clearly important. They are also able to deploy huge numbers of people to work on a project. Being able to throw bodies at a problem is vital in IT. It allows firms to do things such as speed up development cycles or explore alternative approaches that would not be possible with a smaller labour force.

In short, China and India are not simply taking over western IT jobs, they are changing the very process of IT development. It is not about doing the same thing cheaper, but about doing things that sim-

ply could not be done before. In that endeavour, intellectual property is becoming increasingly important.

There are limits to the optimism about India and China. Both countries have a culture of keeping technology to themselves. The western concept of patents is fairly new to them, and has proved controversial for countries at their stage of development. Also, both nations have huge institutional and infrastructure obstacles to overcome. Capital markets are embryonic. Big companies are coddled by the state. India's government bureaucracy is stifling; China's is opaque and corrupt. The legal system is uneven in India and consistently inadequate in China. Both countries badly need more experienced managers.

American technology executives with some experience of India and China are worried that the two are about to eat the rich world's lunch, but locals with deep knowledge of both countries think it will take at least a decade. Still, the overall trend

is clear: the rise of China and India as centres of innovation will radically shake up the technology industry that is today based mainly in rich countries.

In 1905, the first light bulb in India was switched on in Bangalore. A century later, the city's technology industry still relies largely on innovation from elsewhere. The basis of the Indian IT miracle is software services. Indian firms hire thousands of software developers to work on behalf of mainly western clients attracted by the low costs. The average annual salary of a mid-level engineer in India is around \$12,000 (rising by about 10% a year), compared with five or six times as much in the West. These service companies are doing increasingly sophisticated work as their clients come to trust them more. Besides, western firms are under so much competitive pressure that they have no choice but to do more outsourcing.

#### Inside job

A handful of small companies such as Sasken, Ittiam, i-flex and others are trying to break the mould of IT services and develop their own patents to license to others. However, whereas big technology companies in America and Europe are increasingly relying on intellectual property to provide streams of revenue, the large Indian software firms tend to hold on to their innovations for competitive advantage rather than open them up for licensing. This is partly because many of their innovations are in processes rather than in products. Their inventiveness is monetised in work done for clients, not as an income source in its own right.

One example is Infosys, a large IT-services firm. As part of a project for a large aerospace company, Infosys had to calculate and optimise a number of attributes of a part, a task that was expected to take around 30 days. Pressed for time, some of the engineers invented a tool to automate the process which cut the period to only four days. But rather than seek a patent or license it out, they are keeping the process secret for their own and their customers' benefit.

Other Indian IT-services companies have similar innovations. Wipro, another large firm, calls them "IP blocks"—reusable bits of software or processes that it can draw on to serve its clients better. The company has around 10,000 engineers working on higher-end design and development for big global technology firms, but a handful of bright people are assigned to working on Wipro's own R&D, not billable ▶▶

▶ to clients. In a computer lab on its sprawling corporate campus in Bangalore, two twenty-something engineers proudly display the green and gold circuit board for a mobile phone they have designed, which runs the open-source Linux operating system. By developing the technology in-house, they can use the expertise thus acquired for many contracts, lowering the cost for everyone.

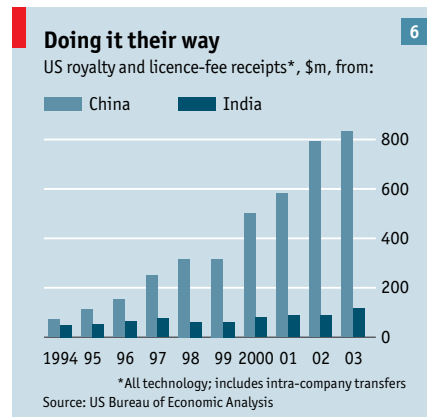
Wipro holds title to “four or five” patents—none of its executives is exactly sure how many. Yet they all happily report that last year it filed 28 innovation disclosures on behalf of clients, which is the first step towards those companies filing for patents. Wipro does not want to compete with its clients, and does not want to license patents to others.

At Infosys, it is a similar story. The firm filed for two American patents jointly with its clients. But like all things in modern India, this is changing fast. Infosys has seven applications pending at America’s patent office, all filed in the past three years. Intellectual property is becoming more important because the IT work the firm is doing is becoming increasingly sophisticated, says “Kris” Gopalakrishnan, the chief operating officer.

One reason why big Indian firms have been slow to embrace intellectual property is the distinction they draw between services companies and product companies. As services companies, they fear that claiming patents would upset their clients, who might treat them as rivals and take their business elsewhere. “India does not have a software industry, it has a services industry,” says one executive. “We do more D than R,” confides another top manager about his company’s research and development. Yet in modern IT the distinction seems artificial, particularly when it comes to intellectual property, which is intangible like a service yet increasingly sold as a product.

A raft of small start-ups may be more prepared to go down the intellectual-property route. Gaurav Dalmia, the boss of First Capital India, a venture fund, notes that the very success of the big software companies prevents them from evolving in this direction: they are not under pressure because they can already count on comfortable returns, and the stockmarket might penalise them for taking the risk. Meanwhile, though, the R&D centres of western firms operating in India are being granted a bundle of patents.

However, even small and nimble firms will have to overcome a latent cultural re-



sistance to mixing business and science that may have a religious base. The Hindu goddess of wealth is Lakshmi, the goddess of knowledge is Saraswati. The two never appear together.

#### Chinese puzzles

In Shenzhen, the boss of Netac Technology, Frank Deng, personally holds around 20 patents. The company, which makes USB memory devices and MP3 music players, has filed for over 200 patents globally, some of which have been granted. Instead of plaques of patents on the wall, as at Qualcomm or Sarsen, Mr Deng keeps five of them in two drawers beside his desk.

Netac is one of a growing number of companies that is investing in R&D and getting patents to protect its innovations. “We couldn’t just follow the Chinese way, the old way, of doing manufacturing and competing on labour costs,” he says. “That is OK in the short term, but we didn’t think it was the right way for the long term. We didn’t want to be a follower but be a leader.” The company’s enlightened attitude to intellectual property may reflect the fact that the founders were trained abroad and worked for big technology firms before starting their own business.

China is better known as a place of rampant intellectual-property infringement, not creation. When the Communists came to power, a rudimentary patent system then in existence was abolished and all inventions were deemed to belong to the state, so there was no incentive to invest in innovation. But now the country is on a long march towards respecting intellectual property, and some progress is being made, notably in IT and telecoms. The number of applications to China’s patent office by Chinese inventors has doubled between 2000 and 2003, and that by foreign firms has quadrupled. The patent sys-

tem is evolving fast, and enforcement, though lagging, is improving.

Take Huawei Technologies, a big vendor of communications equipment, with revenues of \$5.6 billion in 2004. This year, revenue from abroad is expected to surpass that from domestic customers for the first time. Around half of its 34,000 employees do R&D work, claims the company. Its patent filings almost doubled each year during the 1990s, though they have recently started to slow somewhat: the number this year will be around 2,400, and from next year it is expected to settle at around 3,000 a year. In 1995 the company created a special department to work on patents, which currently has 100 people on the payroll but will expand to twice that number next year.

“If you didn’t have patents, you would be in a very disadvantaged position relative to your competitors,” explains Liuping Song, the head of Huawei’s intellectual-property department, at the firm’s headquarters in Shenzhen. “Other companies approach you and charge you for using their patents.” So is the firm chasing after patents simply because other companies are doing the same thing? Mr Song laughs and says, “That is a difficult question to answer.” Then he adds: “We have to play by the rules of the game.”

Finding out how to do that has been a long and difficult process. In 2003, Cisco Systems sued Huawei for copying its intellectual property, which eventually persuaded the Chinese firm to take the offending products off the market. Wiser after that and other experiences, Huawei now plans to use intellectual property to its advantage. It makes a point of taking part in standards groups and publishing research papers. “In many new technological fields, we will have our own contributions to the industry,” says Mr Song.

The same sort of thing is happening at other large private Chinese firms that are reaching out to global markets, such as Datang Mobile and ZTE, makers of telecoms equipment, and SMIC, a big semiconductor firm. Some Chinese firms have even turned the tables and begun asserting their own patents. Netac, for instance, sued Sony Electronics, claiming that Sony’s factory in Wuxi infringes Netac’s patents.

Yet, as in India, it will probably be smaller companies that take forward the development of intellectual property, rather than the big firms or the state-owned enterprises that dominate the economy. “They are monopolies which have no need for IP,” explains Joseph Cho, ▶▶

▶ the boss of Pacific Epoch, a Shanghai firm that analyses technology markets. "They have all the market share already."

The number of patents applied for by Chinese inventors at America's patent office is small, but it increased sixfold in the 1990s. Taiwan, an island with 23m people, went from almost nothing in the 1980s to fourth in the number of patents granted, after America, Japan and Germany. "If their continental cousins have the same behaviour, I don't know how many millions of patents will fall on our heads in a couple of decades' time," says Dominique Guellec, chief economist of the European Patent Office.

Much of the new interest in patents is driven by Chinese government policy. The country is hoping to become less dependent on foreign companies by developing home-grown standards in areas such as 3G, DVDs and encryption technology for Wi-Fi, which provides wireless internet access. If it succeeds, foreign companies will have to pay royalties to Chinese firms in or-

der to sell products on the Chinese market, rather than the other way round. "China realises that if it wants to move up the ladder in technology, the first thing it needs to do is fix the IP problem," says Qi Wang of UBS, an investment bank.

#### The start of something big

But is there sufficient incentive for India and China to innovate? Both countries will be able to exploit their labour-cost advantage for a long time to come yet. India will remain a centre of inexpensive software coding; China will remain a place for low-cost manufacturing. But both countries are so populous that they can do lots of things at once. They can keep doing the low-tech work and at the same time develop more high-tech activities, just as America watched its mid-western states become a rustbelt as Silicon Valley started to boom.

One important role for the big IT companies in India and China is to provide talented engineers with the opportunity to gain experience in management before

they set up on their own. In America, Silicon Valley was built not so much by venture capitalists and inventors but by seasoned business executives who spent decades with leading IT companies before starting up on their own. This is just beginning to happen in India and China too.

This leads some critics to the conclusion that outsourcing IT work to China and India will prove to be unwise. In scrambling for short-term savings, American and European firms may be inviting long-term harm. Yossi Sheffi of MIT calls it "the outsourcing trap": exporting low-end IT jobs will create new rivals that will eventually overtake their clients.

Whether or not that dire warning is justified, India and China are bound to emerge as hugely important centres of innovation, says Bruce Lehman, who served as commissioner of America's patent office during the 1990s. "My prediction would be that in 20 years' time India and China will both be responsible for more patents than the US." ■

## The liquidity of innovation

How the new market for intellectual property is changing the technology industry

THE term "patent" implies accessibility. It derives from the Latin *litterae patentes*, or "open letters", which were public documents issued by a ruler that conferred certain rights, such as a rank, a title or an official appointment. In the past, there were patents of nobility, of land conveyance and of monopoly; now there are mainly patents of invention, and they are generally seen as a way of excluding others rather than opening up.

However, the etymology of the term throws light not only on the origins of intellectual property but also, perhaps, on its future. Just as in the beginning patents were as much about public disclosure as about private ownership, they are now starting to be used as a way of spreading technology more widely, albeit in the form of establishing property rights to it.

The intellectual-property system that developed in the West, and is now in use worldwide, has been widely criticised, and for good reason. But this survey has sought to show that the critics are missing the bigger picture. The role of intellectual property is changing from that of an asset used by businesses for their own purposes

to that of an input for webs of innovation among clusters of firms. Intellectual property is moving from enabling a transfer of knowledge to creating a market for it. It is providing liquidity for innovation.

"Patents are more a form of currency than they are a brick wall," explains David Kafer of Microsoft. These days, companies are using intellectual property to provide legal certainty for their development community. Be it through licensing agreements, patent pools or a commons for open-source, innovations are increasingly being shared.

But there is a risk that the industry as a whole might suffer unless even more intellectual-property exchanges can take place. "The question is, are we going to create a world where a few big people create peace for their fiefdoms, or a marketplace for ideas, recognising that the system is not a perfect market?" asks Mr Kafer.

To some, the very idea of turning the patent system into a market is repellent. "It is like a market for forged banknotes ... you can't argue for [such a] market simply because it trades," says Rishab Aiyer Ghosh of the University of Maastricht and

editor of a recent book, "CODE: Collaboration, Ownership and the Digital Economy". Software should be protected by copyright, he believes, but patents discourage follow-on innovations.

Questioning the legitimacy of patents is nothing new. In the early days of electricity, for example, there were debates over whether such innovations should be awarded patents at all, because electricity appeared to be a natural phenomenon, and new ways of harnessing it seemed to be more of a discovery, not an invention. Similar debates are now in progress about software patents and gene sequences.

#### You gain, I don't lose

Some critics believe that the very concept of intellectual property is mistaken. Unlike physical property, ideas are non-rivalrous goods that can be used by many people at the same time without making them any less useful. The term "intellectual property" was widely adopted only in the 1960s, as a way to bundle trademarks, copyrights and patents. Those critics argue that today's rights are too strict and make the sharing of knowledge too expensive. ▶▶

► On an individual basis, this may be true. But something changes when these transactions increase in volume and value. Sharing, as this survey has tried to show, can add more value to an innovation than hoarding it might do. Yet effective sharing requires a property right that can be traded in a market.

"This is a big, big shift and it is continuing," explains IBM's Mr Kelly. "And in any kind of shift, you see all sorts of gears not meshing and all kinds of misbehaviour." Certainly the problems in today's system are real and growing. Reforms are needed. "What is often not recognised is...how the assertion of intellectual property can raise transaction costs and inhibit the development of organisational capital," notes Philip Evans of the Boston Consulting Group. "One innovator's royalties are the next innovator's costs of doing business. There is nothing in economics to say that high rewards and high costs make for a more innovative regime than low rewards and low costs."

What he is saying is that it may be better to limit rather than expand the scope, duration and protection provided by intellectual property. But there is no way of being sure without serious economic study. Inexcusably, that has been lacking. Intellectual-property policies are often made without a proper basis, and strongly influenced by private lobbying.

A first step towards a more coherent policy is the Adelphi Charter issued earlier this month by a prominent group of intellectual-property experts organised by the Royal Society of Arts in London. One of its merits is to lay down a public-interest test for governments to use before expanding intellectual-property rights. The default option, it says, should be to leave well alone, and the burden of proof should be on the advocates of change.

The current intellectual-property sys-

tem was created by the rich world, which is presumed to hold all the property and license it to the rest of the world. But as emerging India and China, among other places, develop patents of their own, the rich countries will start to see the system from a different perspective.

They got a glimpse of this in the period after September 11th 2001, when anthrax germs were being sent to American recipients by post. Politicians immediately considered legislation to compel the German maker of an anti-anthrax drug to grant a licence for its production—only months after American trade officials had lambasted poor countries for considering something similar for AIDS drugs.

More such hypocrisy will be exposed as the rich world becomes a licensee as

well as a licensor of technology. A report issued by America's National Intelligence Council earlier this year asked whether the global liberal trading order could survive the rise of China. Over the next half-century, America will be forced to re-examine its free-trade views, especially in the area of intellectual-property rights.

### An open and shut case

The paradox about intellectual property in IT and telecommunications is that it eases the exchange of technology and acts as a bottleneck for innovation at the same time. The whole system is in a stage of transformation. "Markets require institutions, and institutions take a long time to develop. Today, the institutions for a 'market for technology' are not well developed, and it is costly to use this market," says Alfonso Gambardella of Bocconi University in Milan. As patents become more valuable to those who hold them, they may also become socially more valuable by stimulating R&D or promoting the use of technology specialists, says Ashish Arora of Carnegie Mellon University.

Ideas are to the information age what the physical environment was to the industrial one: the raw material of economic progress. Just as pollution or an irresponsible use of property rights threatens land and climate, so an overly stringent system of intellectual-property rights risks holding back technological progress. Disruptive innovation that threatens the existing order must be encouraged, but the need to protect ideas must not be used as an excuse for greed. Finding the right balance will test the industry, policymakers and the public in the years ahead. ■

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