

# The future of innovation

Everyone has a stake in innovation. However, for the potential of innovators to be harnessed to maximum effect, the environment within which they currently work in many parts of the world has to change

By **Marshall Phelps**

As economies across the world slowly begin the recovery process, innovation is a word that is being heard with increasing frequency. Innovation, we are told, is the key to long-term growth; it will underpin the success of both companies and countries. A discussion on the future of innovation is therefore timely. And as it begins, we need to understand that it is taking place against the backdrop of severe challenges facing the global innovation ecosystem.

What are these challenges? Some are specific to the United States, but many are also being felt in the nations of Europe. And some even affect the innovation hot-spots of Singapore, China, India and other Asian nations.

I will focus on just six.

## **Where have all the VCs gone?**

First, there is the problem of significantly reduced venture capital investment in innovative start-up companies – and the flight of a large portion of the remaining venture capital overseas to those innovation hot-spots. As the *New York Times* reported in late August: “Venture capital is running at the lowest levels in more than a decade, and even angel investors, who invest in far smaller companies than venture capital funds do, are holding back.”

Look at the numbers. In 1999 in the US, venture capitalists invested US\$52 billion in more than 5,400 start-up companies. In 2009, however, VCs will invest barely US\$12 billion in 2,000 companies. That’s a 77% decline in venture financing for promising technology firms in just 10 years.

This is a serious problem, because historically, venture capital has been a key ingredient in the innovation ecosystem that enables small start-ups – the source of most of the truly disruptive innovation over the last 40 years – to grow into successful companies. Research has shown, for example, that a dollar of venture capital is as much as 10 times more effective in stimulating patentable research as a dollar of corporate R&D. That same research found that while venture capital amounted to only 3% of corporate R&D, it accounted for 15% of all industrial innovations.

## **IPOs on the backburner**

Of course, one major reason for this reduced investment – and this is the second challenge we face – is that in the US especially, but also in many other parts of the world, the ability of innovative start-ups with promising new technology to go public has basically evaporated.

To quote an article from 3rd August published in the *New York Times*, going public has become “an unachievable dream for most tech start-ups”.

Again, let’s compare today’s numbers to those of a decade ago. Between 1991 and 1997, there were 1,353 venture-backed IPOs in the US. But between 2001 and 2008, the number of IPOs fell to only 392 – a 71% decline even with the extra year (2008) included in the comparison.

So if there’s no exit strategy for start-ups – or, put another way, if there is no chance for entrepreneurs, technologists

and the venture capitalists who nurture them to get rich by inventing the Next Big Thing – then innovation dies on the vine for lack of the proper nutrients. Instead, the only exit strategy left to most start-ups and their investors is to be acquired by big companies.

Now, big companies such as Microsoft, Google and Apple do innovate as well, and presumably when they acquire a start-up they will put the innovations these firms have developed to good use. But as I noted above, generally speaking, large firms simply do not produce as many of the disruptive, world-changing innovations; those that lead to the emergence of whole new industries and major job growth, as we saw produced by start-ups in the telecom, semiconductor, personal computer, wireless and internet sectors over the past 40 years.

#### **Decline in government support**

A third challenge is the decline, especially in the US, of government-funded support for basic and applied research. Here we are seeing only modest growth or even declines over the last decade in government-supported R&D in the US and the European Union. And this is a problem because historically, such government support for early-stage research has been a critical factor in the emergence of world-changing innovations and whole new industries.

We can, for example, go back to the early 20th century in the US, where agricultural experiment stations backed by national and state governments were instrumental in spawning innovations such as hybrid corn that boosted agricultural productivity worldwide. And beginning in the 1950s and 1960s, government-sponsored research was the midwife of the semiconductor, chip design, aeronautics, satellite, supercomputing, GPS and internet industries.

But today, small innovative companies have a very difficult time getting government support – America's US\$800 billion stimulus package, for example, specifically exempts any of that money from the SBIR, or Small Business Investment Research Act, requirements. And the availability of even simple bank loans for small firms has almost completely dried up, despite the rhetoric from Washington about how the financial system has stabilised.

Disruptive innovation requires patient capital to nurture it. And in today's quarterly-driven, crisis-ridden economic climate, there is just not enough of that to

go around anymore – not from the government, the banks or VCs.

#### **Too much regulation – the Sarbox effect**

The current regulatory climate presents a fourth challenge to the innovation ecosystem. Here I am talking about tax, legal and other regulatory measures that make it either easier or harder for innovative new firms to be formed and grow.

Now, I am not opposed to regulation in principle – who could be, after the disaster caused by irresponsible financial behaviour that we witnessed over recent times? But even the most well-meaning regulations designed to protect the public can have unintended consequences.

Consider the case in the US. Seven years ago, Congress passed the Sarbanes-Oxley financial disclosure and compliance law (also called Sarbox), following various accounting scandals that led to the collapse of the energy giant Enron and other firms such as Adelphia and WorldCom. While there were certainly good motives behind the new Sarbox law, its actual result has been to impose significant burdens on small and medium-sized companies – and according to many experts, severely cripple the ability of innovative start-ups to go public and fund continued growth through stock.

When Sarbox was first proposed in 2002, the Securities and Exchange Commission – the regulatory body that oversees the stock market – estimated that the cost of compliance would be US\$91,000. In fact, according to most estimates, the average cost of compliance is actually a whopping US\$3 million to US\$4 million per year. A survey by law firm Foley & Lardner found that Sarbox increased the costs associated with being a public company by 130%.

For a typical small public start-up with US\$10 million in net income, a US\$4 million charge against earnings incurred from Sarbox compliance means a 40% reduction in profit and market capitalisation that inhibits the firm's ability to fund future innovation and growth.

According to Curt Carlson, the head of SRI International, which incubates start-ups: "Sarbanes-Oxley is certainly a factor in helping to kill off the public market as an exit strategy for technology start-up companies." And without the option of an IPO exit, we inevitably see reduced investment in innovative start-ups.

So it is hard to see how the US\$400 billion in total economic cost of this well-meaning financial law has benefited society

## Patent inefficiency

A sixth challenge confronting our innovation ecosystem is the increasing cost, inefficiency and unreliability of patent systems worldwide.

The US Patent and Trademark Office now takes an average of three and a half years to issue a patent – and often longer – despite the agency's stated goal of deciding on patent applications within 18 months. Indeed, the total number of patent applications waiting for approval has now skyrocketed to 1.2 million – triple the number at the start of this decade.

How does that hurt technology start-up companies? Well, consider the case of small biotech firm MatriLab, which developed a wound-healing gel based on technology it licensed from the University of Wisconsin in 2002. This company won the Wisconsin Governor's Business Plan Contest and was led by an entrepreneur with 25 years' experience in the biotech industry. But because it could not get its patent application approved in reasonable time, it was unable to attract the new investment it needed to commercialise its product. Potential investors, after all, wanted to be assured that this start-up had some level of exclusivity or protection before putting money into the company. So in 2007, MatriLab went belly-up, five years after it filed its patent application for the wound-healing gel.

The patent office did eventually issue the patent – seven years after the application was filed, two years after the company went bankrupt and too late to save a promising new health innovation that might have done the public some good. According to John

White, a patent attorney and former patent office examiner familiar with the case: "This story is repeated thousands of times. Entrepreneurs have no choice but to give up on their dreams."

In Europe, meanwhile, the growing cost and inefficiency of the patent system also stifle inventors and entrepreneurs. According to the *Economist*, it can cost between four and 10 times more to get a patent in Europe than in the US, Japan, China or South Korea. And even if a patent is granted, it must then be validated, at least partially translated and periodically renewed in each country in which the company wants patent protection. This burden was reduced somewhat last year by the London Agreement, under which countries can waive the right to have patents translated into their national language; but fewer than half of the 30-plus member states of the European Patent Organisation have so far signed up. What is more, because litigation occurs in a national context, a court in one country can overturn a patent granted by the EPO or uphold a patent invalidated by it.

By eroding the certainty of patent protection, these factors also undermine the economic incentives for innovation because they limit the ability of entrepreneurs and investors to realise a return on all their investment in R&D.

Of course, in Europe at least, one must also look to the growing wave of anti-IP sentiment – most dramatically evidenced in the recent election of two members of the Swedish Pirate Party to the European

Parliament – as an additional threat to innovation and economic growth.

Intellectual property is a critical component in the innovation mix. In fact, IP is, quite simply, the greatest stimulus to innovation and economic growth ever designed by man. We know, for example, that IP-protected technology innovation accounts for half or more of the growth of many Western economies, the US included (Wendy H Schacht, *Industrial Competitiveness and Technological Advancement: Debate Over Government Policy*, The National Council for Science and the Environment, September, 2000). Wherever IP protections exist, they also produce an average increase in R&D investment of more than 6%. And in today's globalised knowledge economy, the trade in ideas is now growing at twice the rate of the trade in goods (*Intellectual Property: Source of Innovation, Creativity, Growth and Progress*, International Chamber of Commerce, August, 2005).

In every country studied – whether rich and poor – economists have found that it is not capital resources or infrastructure or education *per se*, but rather the strength of a country's intellectual property system, that is the primary spur to technology development and economic growth. As a well-known study conducted for the National Bureau of Economic Research put it in the mid-1990s, in the absence of strong intellectual property rights: "The leading countries have insufficient incentive to invent and the follower countries have excessive incentive to copy."

as a whole. On the one hand, it has imposed real burdens on small and medium-sized companies which pose no systemic risk to the overall economy. And on the other, it has not prevented any bad behaviour by large businesses. AIG and all the other big financial firms whose irresponsible actions led to the global economic meltdown, after all, were all Sarbox compliant.

Now, there are certainly other factors limiting start-up formation and growth, both in the US and in Europe. Over the last decade, for example, increasingly restrictive immigration rules have reduced the number of talented scientists and engineers who come to work in our countries and start businesses. According to SRI's Carlson, three out of four bright Chinese engineering students who used to stay in the US after

graduation are now going back home to start their businesses there.

### The battle for talent

And this issue – the global battle for talent – represents a fifth challenge to our innovation ecosystem. While the US and some European countries are reducing the number of brilliant scientists and engineers who are allowed to come to work and study, Singapore for one is actively seeking them out and luring them with generous salaries, research grants and the freedom to innovate as they wish.

### In search of solutions

If we look at the innovation ecosystem as a kind of soup, we can see that we need to have certain key ingredients if we want to

cook up a healthy innovation environment for tomorrow. These ingredients include venture investment; government support for research; talented scientists and engineers; reliable IP protection; balanced regulations that encourage rather than discourage the formation of innovative start-up ventures; and last, but not least, an entrepreneurial culture.

#### Government dos and don'ts

*Laissez faire* economists may not like to admit it, but government support has long been essential to advances in technology – and to the development of the new industries and broad-based jobs and income growth that result. In the US, such government support was as essential to the growth of the railway industry 150 years ago as it was to the emergence of the semiconductor, aerospace and internet industries during the last 40 years.

The list of successful companies whose birth was at least partially enabled through university research includes Google, Netscape, Genentech, HP, Polaroid, Lycos, Sun, SGO, Amgen and Cisco. In fact, it is estimated that at least 400 major American companies had at least some government support at their birth.

But that said, we must make a distinction between government support for basic and applied research, and government intervention in the marketplace through mandates and technology preferences. The former works beautifully. The latter usually leads to disaster, as the story of high-definition television's (HDTV) early days demonstrates.

Both Japan and Europe failed in efforts to develop government-mandated analogue HDTV programmes in the 1970s and 1980s. They both wasted huge sums on these analogue schemes only to be totally outflanked by the unexpected entrepreneurial invention of a digital HDTV system by the then small US company General Instrument in 1990. By unlocking the secret of digitising television signals, of course, General Instrument inadvertently gave birth to the digital technology revolution. The result was the avalanche of invention, investment and industrial convergence – and the cornucopia of new digital products and services – that we enjoy today.

There is surely a lesson here for those who believe that government can pick the best technology standard or successfully plan the development of new industries. For it must be remembered that the digital revolution was born and first flourished in

the United States precisely because there was no government-directed programme, as there was in Europe and Japan, that was seeking a preferred technological outcome for HDTV. Indeed, history shows that when you lock in mandates, you lock out innovation.

Not only Japan and Europe have made the mistake of mandating technology preferences or picking so-called national champions. Many will recall that in the 1980s, when Americans were getting a little hysterical about the then-feared Japanese juggernaut, we launched our own government-backed programme to support US semiconductor companies. It was called Sematech, and it funnelled US\$500 million dollars into the pockets of 14 US semiconductor companies for the purpose of “enhancing their competitiveness.” The result? Not a thing. To this day, where American semiconductor firms still lead, it is because of good-old fashioned innovation, not government subsidies.

#### Brain drain or brain gain

The United States and Europe are struggling with increased immigration issues today. It is a difficult problem that brings together elements of culture, economics, politics and even religion. But surely we can all agree that for any country that wants to be an innovation leader, attracting the world's most talented scientists, engineers and entrepreneurs is a no-brainer.

Instead of driving such people away, what we should be doing is hanging out huge signs on our borders that say: “Entrepreneurs and geniuses wanted!”

#### Reward risk-taking, do not punish it

Why is it so difficult for politicians and policy makers to distinguish in their regulatory plans between the big companies and financial institutions whose behaviour can affect and even put at risk the whole economy, and the start-ups and small and medium-sized firms that need every encouragement to make a success of commercialising their innovations for the benefit of society?

Do we really need to regulate venture capital along with the big banks, as the Obama administration's Treasury Department recently proposed? VCs are not banks. They do not control the financial system. Instead, they are the most crucial economic midwives of innovation. And in any event, their total invested capital probably wouldn't even pay for the bonuses handed out to AIG's executives!

All that regulations like this will do is drive down venture investment in

## Back to the future!

Do you want to know the secret of the US's economic success over the last 200 years? Perhaps the most critical component was the unique nature of the country's patent system, which was the first in the world to be deliberately directed towards stimulating the creative genius of the common man rather than rewarding privileged elites with the favour of a government monopoly.

Unlike the 18th and early 19th century British patent system, which charged exorbitant application fees equal to 10 times the annual per capita income of the country's citizens, US patent fees were reduced to a level that even ordinary workers and farmers could afford. Administrative procedures were also simplified. And through a host of other means – including allowing anyone applying for a patent by mail to do so postage free – the patent system encouraged innovation on a mass scale.

The results achieved by this democratized patent system were dramatic. Only 13 years after the first patent law was enacted by Congress in 1790, the United States had already surpassed Britain in the number of new inventions patented – even though Britain was the acknowledged leader of the industrial revolution and had three times the population. And by the 1860s, the number of new inventions patented in the US was an astonishing seven times the number in Britain, even though populations were by then roughly equal in size.

The key here, of course, was that the American patent system encouraged a much broader range of creative individuals to take part in inventive activity than was the case at the time in Britain or in other old world countries.

We need to take a similar approach today. Aside from harmonising the patent systems of our countries and making them more efficient and reliable, we also need to make them more accessible and affordable. We need to reduce patent fees for small and medium-sized businesses; and offer IP generation assistance and IP management services to SMEs, as apparently Singapore is doing. And we need to encourage more countries to adopt Bayh-Dole style legislation to encourage the commercialisation of university research.

innovative start-ups even further, thereby further eroding the prospects for recovery.

As for Europe, do we really need to make it so hard for entrepreneurs to start a business? Or, as Switzerland did recently, to regulate bio-engineering research because plants supposedly have feelings? Or to continue to maintain bankruptcy laws that ban a failed entrepreneur from starting another company? As the *Economist* has noted, maybe Europe needs to get a better grip on the whole concept of creative destruction – a term after all coined by European economist Joseph Schumpeter.

In too many countries in Europe, and indeed around the world, once an entrepreneur fails he is finished. Kaput. End of story. Whereas in the US, failure is just a learning experience on the path to future success.

And that is as it should be. In all our regulation of business, we must ensure that we reward rather than punish risk-taking by entrepreneurs and SMEs.

### More collaborative innovation

In today's world, one of the keys to successfully innovating and commercialising new products and services increasingly lies in collaboration. What is more – and this is especially relevant in today's depressed economy – collaboration is also one of the most cost-effective ways to innovate.

But collaboration can be tricky stuff. Which is why intellectual property is so essential in facilitating knowledge transfer and collaborative, or open, innovation.

In fact, it is arguable that intellectual property is the *sine qua non* of open innovation itself. For it provides the legal scaffolding upon which firms can share their most innovative research and partner together to create new products and services. Without IP rights, firms would inevitably resist sharing their ideas for fear that others would misappropriate them. But with such rights, they can share their innovations secure in the knowledge that all are fully protected in deploying them to mutual advantage.

There is no better proof of that than Microsoft. In the past six years, the company's adoption of an open innovation IP strategy has resulted in more than 500 collaborations with other firms – as against almost none before that time. These partnerships include many of the largest Japanese industrial companies, with whom Microsoft did not previously enjoy the best of relations, with a wide array of start-ups and VCs, with which the company

previously had no relations, and with many open source firms, which once were considered the enemy but now in many cases have become allies.

### Building the right innovation infrastructure

Look across the landscape of innovation during this decade. Many exciting start-ups have flourished, from Skype in Europe to YouTube and Twitter in the US. But while we have hundreds of different varieties of social networking firms, very few, if any, have yet found the path to profitability. Nor do these innovations appear to have led to the creation of whole new industries, to substantial job growth and to the creation of broad social wealth for our societies, as we saw with innovations in packet-switching, semiconductors, wireless, PCs and the internet from the 1970s to the 1990s. But there is no reason why they can't, so long as the conditions are right.

The need for innovators to solve grand problems and create major new advances for society has never been greater. New medicines, alternative energy, climate change, health and sanitation, agriculture, transportation, security and privacy – the world now offers innovators a once-in-a-century set of opportunities to make real change in the world.

I have spent most of my career with big companies – IBM and Microsoft. They are companies that can rightly be proud of the innovative work they have done; they, and others like them, clearly have lessons to teach. But in any discussion about the future of innovation, we must pay special attention in our discussions to the needs of the start-ups and the small and medium-sized enterprises that are the source of most of the disruptive innovations that change the world. For all our sakes, the obstacles to them fulfilling their remit have to be removed. *iam*

**Marshall Phelps** recently retired as head of IP policy and strategy at Microsoft. With David Kline, he is the co-author of *Burning the Ships: Intellectual Property and the Transformation of Microsoft* (John Wiley & Sons, 2009)