

Resilience amid turmoil

Benchmarking IT industry competitiveness 2009



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Preface

R*esilience amid turmoil: Benchmarking IT industry competitiveness 2009* is an Economist Intelligence Unit white paper, sponsored by the Business Software Alliance (BSA).

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Our research drew on two main initiatives:

- We updated our benchmarking model, the IT industry competitiveness index, which compares 66 countries on the extent to which they support the competitiveness of information technology (IT) firms.
- We conducted in-depth interviews with 13 senior executives of IT firms and independent experts from across the globe who are knowledgeable about the drivers of IT competitiveness.

The author of the report was Iain Morris and the editor was Denis McCauley. Our sincere thanks go to the interviewees for sharing their insights on this topic. The following individuals were interviewed for the study:

Jonathan Ball, partner, Norton Rose

Mark Bregman, chief technology officer, Symantec

Egon Berghout, professor of business and IT, University of Groningen

Trip Chowdhry, analyst, Global Equities Research

Francis Cripps, president, Alphametrics

Doug Freedman, analyst, Broadpoint AmTech

Herbert Heitmann, chief communications officer, SAP

Ken Juster, executive vice-president of law, policy and corporate strategy, Salesforce.com

AS Lakshminarayanan, vice-president and head of Europe, Tata Consultancy Services

Daniel Levy, general manager, African and Middle Eastern operations, Alvarion

Sean Murphy, partner, Norton Rose

Lin Sun, independent consultant on China's IT and telecoms markets

Scott Taylor, legal counsel, Symantec

September 2009



Executive summary

With the onset of the worst global recession in decades, new threats to the competitiveness of national IT (information technology) sectors are materialising. Industry health overall has held up well despite sharply reduced spending in most parts of the world on IT hardware, software and services. However, protectionist instincts are on the ascendant, even in the most free-market economies, while venture-capital and other forms of funding are being squeezed. Even the biggest IT firms are cutting back on their investments in R&D (research and development). In addition, the downturn means that broadband companies may be unwilling to fund new deployments without better regulation. As the Internet becomes a prerequisite for many parts of the IT industry, such hold-ups could harm the IT sector's development in many countries.

Most governments correctly view the IT sector as an important engine of economic growth, and many are taking measures to stimulate sector output as a means of accelerating economic recovery. More important to long-term IT sector competitiveness, however, is sustained attention to the factors in the industry environment which enable IT firms to compete effectively. These include the quality of the local technology infrastructure, the availability and quality of IT talent, the innovation environment, the legal regime, and the overall business environment, as well as the government's technology policy itself—all central pillars of the IT industry competitiveness index.

The Economist Intelligence Unit's third annual study into IT sector competitiveness finds that the US remains the world's most conducive environment for the development and growth of IT firms, despite a tougher business environment and the emergence of protectionist impulses. Canada and west European countries such as Finland, Sweden and the Netherlands are also prominent in the index top tier, owing to their robust IT infrastructure and strong support for technology R&D, among other factors. In emerging markets, large pools of skilled IT employees remain a significant advantage for China, India, Russia and other countries, but uneven progress in other areas, such as IT infrastructure, remains a drag on sector competitiveness.

Following are the other major findings of this year's study:

- **Protectionism and support for "national champions" will hinder recovery efforts—and longer-term sector competitiveness.** The "buy local" provisions attached to some stimulus plans have been criticised by some IT industry executives for not recognising the increasingly global nature of the industry. Lavishing public money on struggling companies will also only prevent more innovative firms from being able to compete.

- **Broadband networks are becoming increasingly essential to IT firms' competitiveness.** Broadband's importance will grow as more IT services and applications are delivered over the Internet. Technology producers in broadband-rich countries in western Europe, North America and developed Asia are clearly at an advantage in this respect. Conversely, the slow march of broadband in emerging markets, including those with large IT sectors such as India, Brazil and Russia, could impede their IT firms' growth.



● **Investment in skills development remains a long-term imperative.** The recession has eased the talent shortages that had plagued many IT firms until about a year ago. But as economies recover and hiring eventually resumes, competition for the best talent will again grow fierce. Co-ordinated efforts among governments, universities and IT firms are needed to improve the quality of technology training and expand the pool of potential hires. In Asia, IT training would benefit from greater investment in business studies and language skills. In Europe and North America, governments must work with private-sector companies to encourage more young people to choose mathematics and science-based subjects at universities.

● **IP regimes are improving in many emerging markets, but more progress is needed.** Robust IP (intellectual property) protection remains essential to IT sector competitiveness. IP regimes are strong in most developed markets, and emerging economies such as Brazil, Egypt and Vietnam are also registering slow but steady progress, particularly in the area of enforcement. As innovation gradually becomes more important than low-cost labour to IT firms in China and India, IP enforcement is expected to improve in these countries as well.

The crisis has created new economic and business conditions for IT producers, but for policymakers the importance of nurturing competitive IT industry environments to bolster economic growth remains unchanged. Competitiveness begins with open, investor-friendly business and legal environments. Technology innovation is another imperative, whether through expansion of funding available for start-ups or other inducements to technology R&D. Improvement of infrastructure and IT skills development must continue in developed and emerging countries alike. If governments do nothing else, however, they must avoid the siren call of protectionist market practices that will only hinder recovery and harm long-term sector competitiveness.

Movements upward and downward

There is a large degree of continuity in the overall index results from last year to this year. Nineteen of the top 20 index countries in 2008, for example, remain in the top 20 this year. However, there have occurred some significant upward or downward shifts for a handful of countries owing both to changes in their performance as well as to improvements in the sources of data used to measure some indicators (see box, “Steps forward in measuring competitiveness”, below for more details). The most noteworthy shifts include the following:

Finland has risen to 2nd in the index based mainly on its strong performance in the R&D environment category, particularly patents, and improvement in its overall business environment.

Taiwan and **South Korea** have suffered steep falls—the former from 2nd to 15th and the latter from 8th to 16th—due

predominantly to deterioration in their R&D environment scores. These are a result of a change in the data source used in the index model to score IT-related patents.

China, Russia and **Ukraine** have each climbed several notches in the index table—China and Russia by 11 places and Ukraine by seven places—on the strength of improved scores in the R&D environment and human capital categories. These are attributed to the aforementioned change in IT-related patent data as well as a change in the data used to estimate IT employment levels.

Turkey has fallen eight places in the table owing to deterioration in its R&D environment and human capital scores, which is due primarily to the change in patent and employment data sources mentioned above.

Deterioration in the business environment as well as lower scores in the IT infrastructure and human capital categories are the main reasons behind the index drop suffered by **Thailand** (seven places).



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IT industry competitiveness index 2009: Overall scores and ranks

Country	Score	2009 rank	2008 rank	Country	Score	2009 rank	2008 rank
United States	78.9	1	1	Slovakia	41.4	34	31
Finland	73.6	2	13	Poland	40.8	35	32
Sweden	71.5	3	4	Romania	39.6	36	39
Canada	71.3	4	6	Croatia	38.3	37	41
Netherlands	70.7	5	10	Russia	36.8	38	49
United Kingdom	70.2	6	3	China	36.7	39	50
Australia	68.7	7	7	Brazil	36.6	40	43
Denmark	68.6	8	5	Argentina	36.5	41	46
Singapore	68.2	9	9	Malaysia	35.6	42	36
Norway	67.1	10	14	South Africa	35.3	43	37
Ireland	66.9	11	15	India	34.1	44	48
Japan	65.1	12	12	Saudi Arabia	33.9	45	40
Israel	64.3	13	16	Turkey	33.8	46	38
Switzerland	63.5	14	11	Bulgaria	33.6	47	45
Taiwan	63.4	15	2	Mexico	32.0	48	44
South Korea	62.7	16	8	Thailand	31.8	49	42
France	59.2	17	20	Ukraine	31.4	50	57
Belgium	59.2	18	22	Philippines	28.5	51	47
New Zealand	58.8	19	17	Colombia	28.4	52	52
Germany	58.1	20	19	Egypt	26.8	53	53
Hong Kong	57.5	21	21	Kazakhstan	26.4	54	59
Austria	57.0	22	18	Peru	26.0	55	55
Estonia	55.6	23	24	Vietnam	25.0	56	61
Italy	48.5	24	25	Venezuela	24.4	57	51
Spain	47.4	25	23	Sri Lanka	23.9	58	54
Czech Republic	47.0	26	29	Indonesia	22.8	59	58
Chile	46.1	27	30	Ecuador	22.7	60	56
Hungary	46.1	28	28	Azerbaijan	21.3	61	63
Slovenia	45.3	29	26	Bangladesh	21.1	62	60
Portugal	45.3	30	27	Pakistan	20.0	63	62
Lithuania	43.3	31	35	Algeria	19.8	64	65
Greece	43.0	32	33	Nigeria	18.8	65	64
Latvia	42.6	33	34	Iran	17.1	66	66

Countries are scored on a scale of 1 to 100. A four-decimal score is used to determine each country's rank.

Source: Economist Intelligence Unit.



Steps forward in measuring competitiveness

Benchmarking IT sector competitiveness across 26 indicators and 66 countries presents some unique methodological and data-gathering challenges. The Economist Intelligence Unit created the index model in 2007 and has continuously striven since then to refine its workings. This year is no exception, and the changes made represent, in our view, clear steps forward in assessing and comparing IT industry environments across a large group of countries. Some of the changes, particularly regarding patent and employment data, have resulted in significant shifts in score and rank for a handful of countries.

The model improvements made in 2009 are highlighted below.

- We have added a new indicator, **mobile phone penetration**, to the IT infrastructure category. The use of mobile devices is becoming an important factor in a workforce’s ability to access broadband and other communications networks and to enhance productivity.
- We have sourced newly available data on **IT-related patent applications** from the European Patent Office (EPO) to score this indicator in the R&D environment category. We now utilise hard data for the majority of countries where previously we estimated IT-related patent registrations for all countries. The index ranks of Taiwan, South Korea and Finland have been particularly affected by this change.
- In calculating **employment in the IT sector**, we are now able to use hard data from the Organisation for Economic Co-operation

and Development (OECD) for a large number of countries. This has also enabled us to refine our estimates for non-OECD countries. (Previously, we estimated IT employment for all countries in the index.)

- We have adjusted the **weights of several indicators**. The category and indicator weights were formulated at the time of the index’s creation by the Economist Intelligence Unit’s modelling team using, as a guide, individual correlation coefficients of each indicator against a measure of IT labour productivity. The weights are reviewed each year by the modelling team, and those for selected indicators have been adjusted in 2009, both to accommodate the new mobile indicator and to reflect the team’s evolving views on the relative importance of all the indicators. (The weight relationships of indicators suggested by the original correlations, however, have been maintained.)

For details on the indicators, weights, scoring methodology and definitions, see Appendix 1.

Indicator categories	Weight
Overall business environment	0.10
IT infrastructure	0.20
Human capital	0.20
Legal environment	0.10
R&D environment	0.25
Support for IT industry development	0.15



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Key points

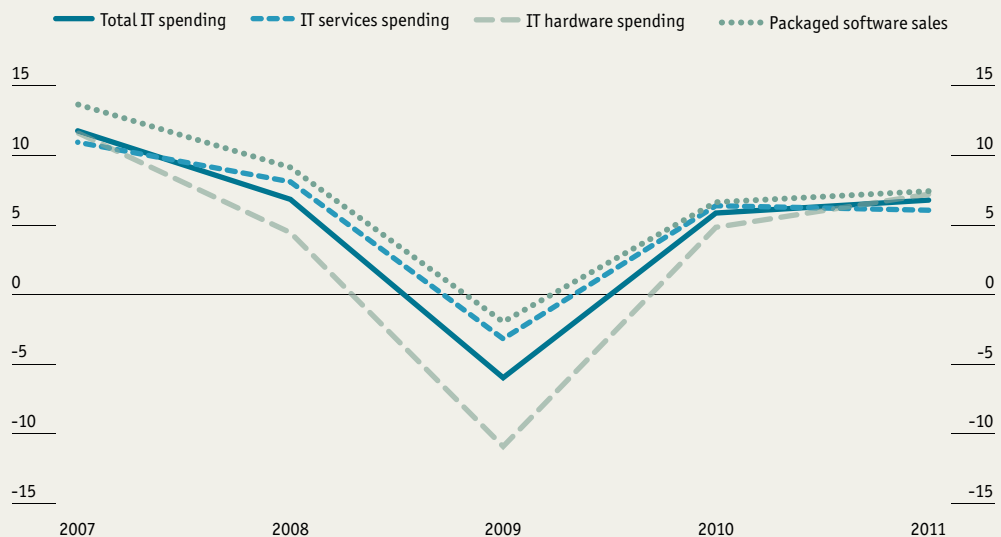
- The IT industry is faring better than other sectors in the recession, although start-ups and smaller firms suffer from limited capital availability.
- Business environments in developed countries have deteriorated but remain supportive of competition, foreign investment and trade; progress to improve business environments is mixed in emerging markets.
- Government stimulus plans could generate opportunities for some IT firms, but “buy local” and other protectionist provisions will harm competitiveness.

A tough new environment

Not since the dotcom crash at the turn of the century has the IT sector faced such a tough operating environment. Last year’s turmoil in the financial services industry has pushed the global economy into its worst recession since the 1930s. The Economist Intelligence Unit now expects real GDP to shrink worldwide by 2.4% in 2009 (at market exchange rates), and the decline in parts of the developed world will be particularly severe.

Although the IT industry has been faring better than other sectors, it is by no means immune to the current downturn. Makers of computer hardware have had a bruising several months, and we expect their sales to contract by 11% globally this year, as corporate customers and consumers delay spending on equipment. Software spending is expected to be more resilient, falling by around 2%, because of its importance to the running of the modern-day enterprise. Even so, much of the revenue has been

Worldwide spending on IT, 2007-11
(% growth; US\$)



Sources: Economist Intelligence Unit; IDC.



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generated by maintenance fees paid by corporations to long-standing providers of business software. Sales of new enterprise software, in fact, fell sharply for some large providers in the first quarter of this year. The IT services sector is also expected to suffer in the downturn, with expenditure falling by more than 3% in 2009.

For the biggest industry players, however, there is no reason to panic. For a start, this downturn is not born of the IT industry, like the last, and so the fundamental drivers of growth remain in place. There is no Y2K overhang and not as much excess capacity in the market as in 2000. Moreover, blue-chip IT companies were quick to de-leverage after the tech-sector bust, and most look healthy from a balance-sheet perspective. More troubled are the start-ups and smaller firms. As Sean Murphy, a partner with Norton Rose, a UK-based law firm, points out, venture-capital firms have retrenched and are now focused on supporting their existing portfolios, leaving limited capital available for new investments.

Policymakers under scrutiny

Nevertheless, with R&D spending expected to come under pressure, and even the mightiest firms announcing big job losses, the need for robust government policy is stronger than ever. Effectively targeted stimulus spending could provide a fillip, especially where it is tied to technologies that have already attracted regulatory and industry interest. Two subsectors that could soon flourish, for those reasons, are IT for smart grids—aimed at making energy provision less wasteful—and online healthcare, according to Trip Chowdhry, an analyst with US-based Global Equities Research. More generally, the clean-tech sector is attracting a large amount of stimulus funding, particularly in South Korea (see box, “South Korea gets smart”).

Governments, however, have difficulty even at the best of times in striking a balance between support which encourages industry growth and that which favours specific companies or technology standards at the expense of others. In our index category of support for IT industry development, Norway remains the leader, with Canada, the US, the UK and Finland the other countries which come closest to providing effective industry support while minimising market distortion.

IT itself is attracting less support than some companies would like to see. Herbert Heitmann, chief communications officer at SAP, a business software provider with headquarters in Germany, believes that some governments are failing to recognise the importance of IT to the wider economy and are wasting their efforts on short-term packages aimed at particular sectors. He is highly critical of Germany's car-scrapping scheme for that reason. “It's a big boost for manufacturers, but it is not sustainable: the industry will suffer again once the programme ends,” he says. “Policymakers should support technologies that are cross-vertical and designed to improve the competitiveness of various industries.”

A few policy efforts that have come in response to the downturn look muddled and damaging. In Japan, the government quickly stepped in to support Elpida, a national chipmaker, and yet the case for non-interference is strong given the glut of capacity in the semiconductor market. In the US, the “Buy American” provisions originally included in the public stimulus package were waived by the federal government in mid-2009 after attracting criticism from a number of technology firms for not reflecting the commercial reality of an increasingly global industry. “As a multinational company we want to see a level playing field and not support for protectionist policies, whether from the US or other

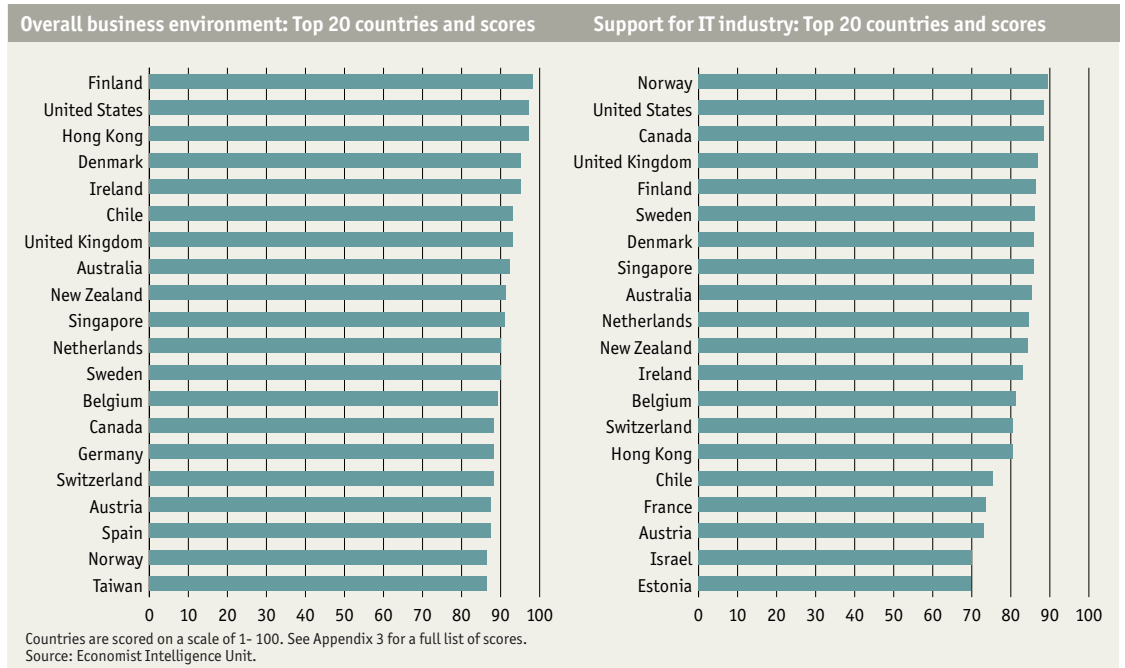
“More and more international transactions happen over the Internet and are supported by IT infrastructure, so we're obviously worried about protectionist barriers to this.”

Scott Taylor, legal counsel, Symantec



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governments,” says Scott Taylor, legal counsel for Symantec, which develops software for security and storage purposes. “More and more international transactions happen over the Internet and are supported by IT infrastructure, so we’re obviously worried about protectionist barriers to this.”

Doug Freedman, a semiconductor analyst with Broadpoint AmTech, is similarly concerned about the effect of such protectionist measures in the semiconductor market. “The lines start to blur in this industry because our supply chain is truly global,” he says. “There are quite a number of fabs in the US and a lot of packaging plants in Asia. It is hard to say where the value added is and where the content really comes from.”

Beyond specific efforts to support the IT industry, governments also have an impact on IT producers more broadly through their backing for an open and level playing field for all competitors in domestic markets. In tough economic times, government backsliding is all the more likely when it comes, for example, to receptivity towards foreign investment and avoidance of excessive regulation. The business environment scores of most rich-world countries—those hardest hit thus far by the recession—have indeed declined on the previous year, but these countries remain nonetheless firmly committed to wide-ranging competition, transparent regulation and the protection of private property, as well as thriving crossborder trade and foreign investment.

While business environments have improved in several emerging markets with sizeable IT sectors such as China, Vietnam and Ukraine, others, such as in Russia, have deteriorated. The mood of caution, and the need to adapt to gloomier circumstances, have already compelled Tata Consultancy Services (TCS), India’s biggest IT services company, to postpone a planned move into new markets like Russia and instead focus on its existing operations. The favouring of domestic technology champions—and other forms of protectionism—will only dissuade even more international organisations from supplying the capital that national industries need to remain competitive during the downturn.



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Key points

- Broadband availability is becoming increasingly essential to IT sector competitiveness, as more IT offerings are delivered over the Internet.
- Broadband penetration and PC ownership continue to languish in emerging markets, putting their IT sectors at a disadvantage vis-à-vis more developed markets.
- Mobile-device penetration, however, is of growing relevance to software and other IT producers; many emerging markets score highly in this new index indicator.

Maintaining infrastructure momentum

The importance of the IT and communications infrastructure to a country's economy is becoming increasingly apparent. According to a study of 120 countries by the World Bank, for example, for every 10% rise in broadband penetration—a heavily weighted infrastructure indicator in our IT industry competitiveness index—there is a 1.3% rise in GDP.¹ What is also becoming clear is the essential nature of modern broadband infrastructure for the IT sector. “Broadband availability is clearly a prerequisite for many parts of the IT industry, as more and more IT offerings get delivered over the Internet,” says Ken Juster, executive vice-president of law, policy and corporate strategy at Salesforce.com, a provider of cloud computing solutions for enterprises.

Countries where broadband is pervasive, such as Denmark, Sweden and the Netherlands, clearly have a big competitive advantage in this respect, and score highly in both the IT infrastructure category as well as the overall rankings. In such markets there appears to be little need for new government intervention. Interestingly, however, three other countries that fall within our overall top ten—the US, UK and Australia—are among the world's most prominent in developing broadband stimulus plans, showing how much importance their governments attach to improving broadband access.

That stimulus efforts are being directed this way is encouraging, although it remains to be seen whether funding commitments are sufficient to make a difference. In the US, just US\$7bn of the US\$800bn earmarked for economic stimulus is being channelled into broadband—a relatively small percentage of the amount already being invested in new fibre-optic networks by the country's leading operators. In the UK, the government is planning on using funds that become available during the switchover to digital TV for new broadband investments. In Australia, meanwhile, the government has announced a highly ambitious scheme to spend US\$30bn on a nationwide fibre-optic network, using a combination of public- and private-sector money.

More worrying is the situation in emerging markets, where technology take-up and broadband penetration is floundering. Usage of fixed devices such as PCs is low, but this could change as costs fall. Daniel Levy, general manager of Alvarion, an Israeli company that builds wireless broadband networks, believes the very fact that more IT applications are residing in the network will help to lower hardware costs and spur adoption. “This is a positive development for emerging markets, because it will reduce the need for maintenance, replacement and upgrades,” he says.

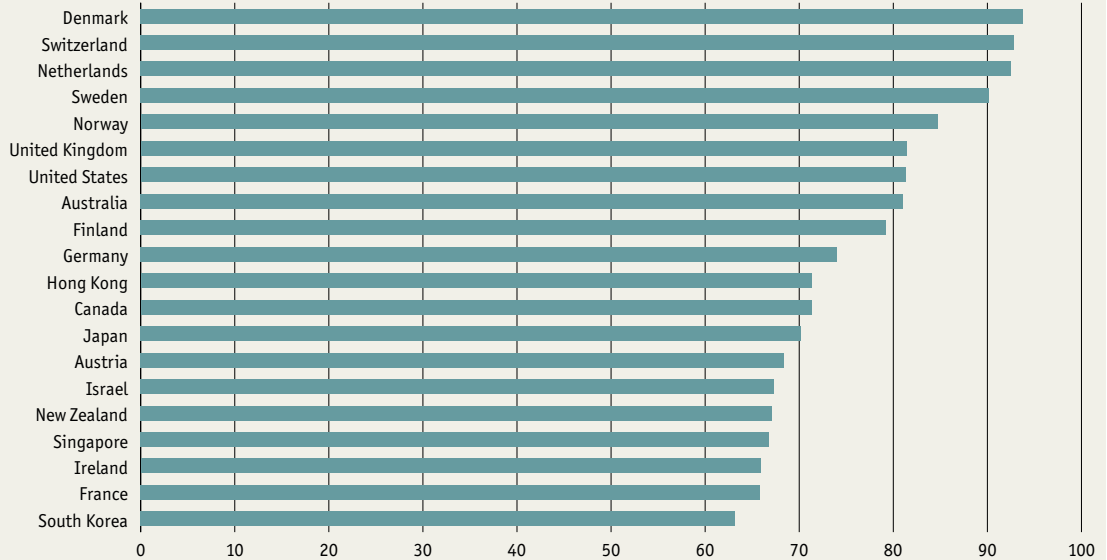
¹ The World Bank, *Information and Communications for Development 2009: Extending Reach and Increasing Impact*, 2009.



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IT infrastructure: Top 20 countries and scores



Countries are scored on a scale of 1- 100. See Appendix 3 for a full list of scores.
Source: Economist Intelligence Unit.

“An investor will not spend US\$2m–5m on wireless spectrum unless he is certain the investment will be protected. That has a direct impact on IT competitiveness.”

Daniel Levy, general manager, African and Middle Eastern operations, Alvarion

A big issue in some countries is the lack of any fixed-line infrastructure that can be modified to supply broadband services. For all India’s IT industry strengths, it scores next to last in this category because of this weakness. Mr Juster believes that new wireless technologies could help emerging markets to overcome some of their infrastructural shortcomings, and he calls for more straightforward regulation to boost broadband deployments. Yet progress is being hampered by the lack of clear regulatory planning and enforcement in this area, which is discouraging to investors. As Mr Levy of Alvarion comments: “An investor will not spend US\$2m–5m on wireless spectrum unless he is certain the investment will be protected. That has a direct impact on IT competitiveness, of course.” The biggest culprits in this respect are Brazil, India and Russia, where persistent hold-ups to the award of new spectrum have been aggravated by rivalry between supporters of different technologies, each lobbying the regulatory authorities for preferential treatment.

Fixed and wireless networks mean little, of course, unless businesses and individuals have devices that connect to them. Ownership of personal computers (PCs) therefore remains another heavily weighted IT infrastructure indicator. While most developed countries boast PC (desktop and laptop) ownership rates ranging between 60% and 85% of the population, rates in many emerging markets with rapidly growing IT sectors such as China, India, Vietnam and Ukraine languish under 20%.

Upwardly mobile

High-speed networks can be reached with more than fixed devices, however. Just as broadband services are becoming a prerequisite for IT firms to do business online, so mobile-phone penetration is assuming greater relevance for the software business. Handheld devices that enable fast web surfing and data communications are becoming increasingly popular despite the recession, and the setting up of online smartphone applications stores by companies such as Apple is spurring software innovation in this space.



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World leaders in broadband penetration		World leaders in mobile penetration	
Denmark	37%	United Arab Emirates	173%
Netherlands	36%	Greece	171%
Switzerland	35%	Portugal	148%
Hong Kong	34%	Estonia	148%
Norway	33%	Lithuania	145%
Canada	33%	Italy	144%
South Korea	32%	Bulgaria	141%
Sweden	31%	Singapore	139%
Finland	31%	Czech Republic	134%
Australia	30%	Russia	131%

Figures shown represent subscriptions penetration of the population at end-2008. (Individuals may have more than one mobile subscription.)

Source: Pyramid Research, OECD, national regulatory agencies.

The relatively low costs needed for applications development, and the fact that no industry giants have yet monopolised the space, make this one area where innovation could easily come from new markets.

China's operators, in particular, are trying to lead the establishment of applications stores based on their own handset operating systems. "Those would be open so that developers can add their applications to that platform for download," says Lin Sun, an independent analyst covering China's telecoms and IT markets. "China's software companies are desperately trying to increase their competitiveness in this area."

South Korea gets smart

Could smart grids be the next big thing? If so, South Korea looks the place to be. The government has announced that a whopping US\$84.5bn—about 2% of the East Asian country's total GDP—will be invested in green technologies over the next five years in a bid to boost the competitiveness of its economy. A government aim to create a nationwide smart electricity grid by 2030—and be the first country in the world to do so—means that companies in this technology area may be poised to prosper.

Details are still scanty, but, judging by South Korea's success at making broadband pervasive, few would challenge the government's commitment to the project. Moreover, the effect of a nationwide smart grid on some of the biggest IT companies, let alone the South Korean economy, would be dramatic. According to

Trip Chowdhry, an analyst with US-based Global Equities Research, IT would be the glue that binds the whole smart-grid ecosystem together. International powerhouses like IBM, Cisco and Google, as well as some of South Korea's home-grown firms, are looking to capitalise on interest in this area.

Since the South Korean stimulus package was first announced, a US organisation called the GridWise Alliance, which includes IT producers such as IBM and Hewlett-Packard, has teamed up with the Korea Smart Grid Association (KGSA) to share R&D into building smart-grid technology.

According to the Korea Times, authorities reckon the smart-grid project could create up to 500,000 new jobs annually and reduce South Korea's power consumption by 3% by the time it is ready in 2030. "The money's there, the opportunity's there and there's a regulatory push, as with carbon credits," says Mr Chowdhry in discussing the smart-grid phenomenon more generally.



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Key points

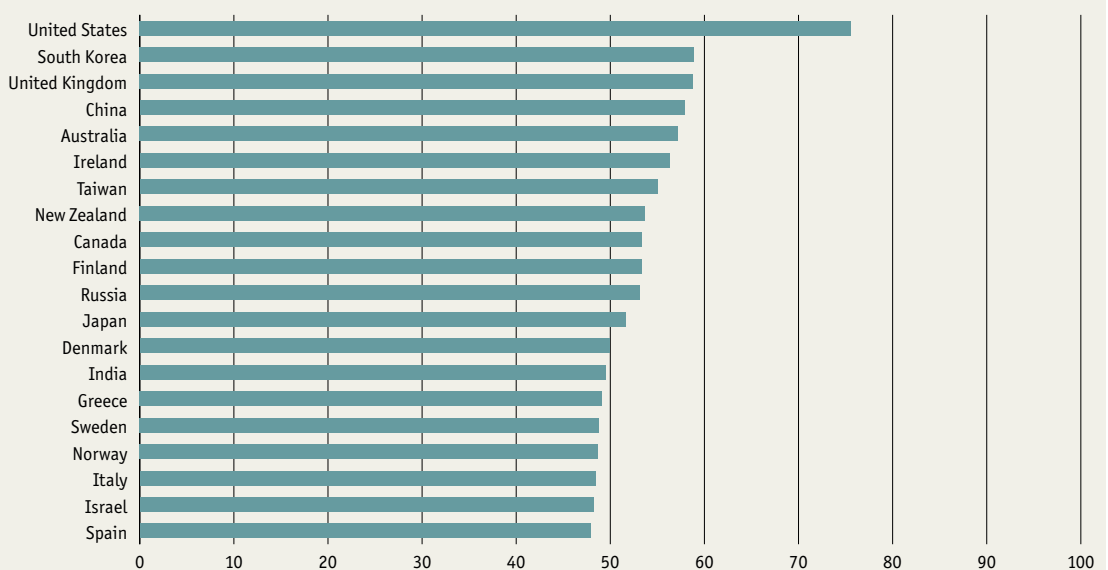
- The recession has temporarily eased the talent crunch for IT firms, particularly in developed markets.
- Talent shortages will re-emerge, however, and many producers continue to work with universities, government and other firms to improve technology education.
- Asian countries continue to produce large numbers of IT employees but lag North America and Europe in providing well-rounded technology education.

Talent wars present and future

As levels of unemployment soar, the hunt for available IT talent has suddenly become much easier in many parts of the world. Furthermore, those mathematics and science students that may once have sought placements in large banks or financial services institutions are being forced to look elsewhere. Technology companies, and other organisations with an interest in technology, are likely to be the prime beneficiaries of this development.

Nevertheless, as the global economy recovers and hiring resumes, IT companies will again be in fierce competition for the best brains in the market. When that happens, job hunters in more heavily regulated labour markets like Germany and France could lose out, according to Mr Heitmann of SAP. “[Downsizing] was a painful and expensive process in those countries, and I have a hard time believing that many new jobs will be created there,” he says. “Instead, they will be in China, India and the US—wherever you have the flexibility to respond to significant changes in the marketplace.” Notably,

Human capital: Top 20 countries and scores



Countries are scored on a scale of 1- 100. See Appendix 3 for a full list of scores.
Source: Economist Intelligence Unit.



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all three countries preferred by Mr Heitmann score highly in the human capital category of our index, with the US first and China fourth, while Germany and France occupy positions well down in the table.

A longer-term challenge for some European countries is encouraging more graduates to choose science-related subjects. Egon Berghout, professor of business and IT at the University of Groningen in the Netherlands, says more IT employees are coming from abroad to fill the talent gap caused by the growing popularity of arts-based subjects over the sciences in Dutch universities. This may partly explain why the Netherlands languishes in 27th position in our own category rankings. "A lot of talented people are now coming to the Netherlands from east European countries," says Mr Berghout.

In global terms, however, Europe will continue to suffer a disadvantage of scale as a source of IT talent. "East European countries such as Bulgaria offer a great talent pool," says Mr Heitmann, "but the number of graduates from universities there is too low to meet our long-term demand. That is why labs in such locations are rather specialised and focused in terms of product development. At the same time we have set up global hubs in countries such as China and India, where we leverage the available talent pool and can achieve significant scaling effects."

India's TCS has long been involved in educational initiatives, and the firm is now adapting its methods of working with academic institutions as India's IT sector matures and competition grows. "As other companies entered the market, we had to build a closer relationship with the universities,"

Coping with India's talent crunch

Rising international competition and the demand for more value-added services means that India's IT outsourcers need talent in spades. Tata Consultancy Services (TCS), India's biggest IT company, now employs 140,000 workers and is striving to ensure that the supply of skilled, low-cost labour does not run dry.

A shortage, however, is a real possibility. According to a report commissioned by the National Association of Software and Services Companies (NASSCOM), India is facing an IT talent shortfall of between 800,000 and 1.2m workers by 2012. TCS is trying to ward this off by cultivating the domestic skills pool. It remains actively engaged with academic institutions and augments its own training programmes through close collaboration with universities throughout India. Moreover, its rivals are following suit. According to a new report from the World Bank,² Infosys has invested more than US\$120m in a Global Education Centre in Mysore that can train up to 13,500 workers at a time. Satyam is also working with more than 100 universities on training initiatives and course design.

Nevertheless, given concerns that India may not be able to satisfy the appetite of its outsourcers for new staff in the future, and the opening up of other labour markets where costs are even lower than in India, companies like TCS have increasingly been looking

abroad to fill new positions. TCS now employs 14,000 people outside India, around 10% of its total workforce, having had fewer than 100 non-Indian workers just five years ago.

There are other good reasons to look further afield, according to AS Lakshminarayanan, vice-president and head of Europe for TCS. The company opened offices in Latin America primarily to serve Latin American customers with a need for Spanish-speaking workers. It has moved into Budapest in Hungary partly to ensure compliance with EU data privacy laws when catering to European companies. Although Mr Lakshminarayanan resists using the word protectionism, he says there is certain sensitivity about where some work is done. This is one reason that TCS employs about 4,500 workers in the UK.

The main attractions of any new business environment, however, continue to be quality, scale and cost, notes Mr Lakshminarayanan, and very rarely are all three to be found in one place. A low-cost environment and skilled IT workforce have attracted TCS to markets like the Philippines and Egypt; yet even in such populous countries it does not believe there is a sufficient supply of new labour. Despite NASSCOM's worries, when it comes to the key workforce factors, maintains Mr Lakshminarayanan, India retains an advantage over other parts of the world.

² The report is cited in footnote 1.



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says AS Lakshminarayanan, the firm's vice-president and head of Europe. "Before we would train people up for about six to eight months after recruiting them to make sure they understood the business. We've since worked with institutions to reduce the training period, so people can start work after just three months of internal training instead. We're now fully engaged with universities to make sure that curricula are right." (See box, "Coping with India's talent crunch".)

Symantec runs a similar programme in the US, which is aimed at getting more students into the field of IT network security. "The National Security Agency—just one part of the government focused on this—needs as many as 1,000 candidates to fill targeted positions each year, and yet it is currently attracting only about 700," says Symantec's Mr Taylor. "Right now there is a real shortage."

More than just IT training

Despite the reputation of Asian markets for producing IT talent, there are concerns. Lin Sun attributes Western countries' lead in the field of invention at least partly on China's educational shortcomings. "Very few Chinese universities offer IT or software qualifications at a very advanced level," he says. "The government is trying to increase the number of departments at Chinese universities, so that more people can apply to study these subjects, but you need professors and teachers and there's also a shortage of those. It's going to be a long process."

Francis Cripps, the president of Alphametrics, a software company based in Thailand, stresses the importance of language skills, believing there is a desperate need for better English-language education in various Asian countries—Thailand included. "These days in the software industry you have to do more documentation than source code," he says. "If you've got people who are good at English and not expensive, you've got a tremendous head start. Yet in Thailand there's very little higher education in English."

Mr Cripps also thinks too much emphasis is put on IT skills for their own sake. "My quarrel with the universities I visit is that they don't think of IT as a business. They think of it as learning Java, and so the people who graduate have no idea how to use IT skills to build a business," he says. "You need to learn about the business problems that IT software can address—such as accounting and administration—and combine that with pure IT studies before you can be really useful."

The Economist Intelligence Unit agrees. An important human capital indicator in our index is the capacity of a country's education system to train technology professionals with business as well as mainstream IT skills. The US, UK and Ireland stand out among other countries on this measure, along with Australia, Canada and Singapore.

"You need to learn about the business problems that IT software can address and combine that with pure IT studies before you can be really useful."

*Francis Cripps, president,
Alphametrics*



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Key points

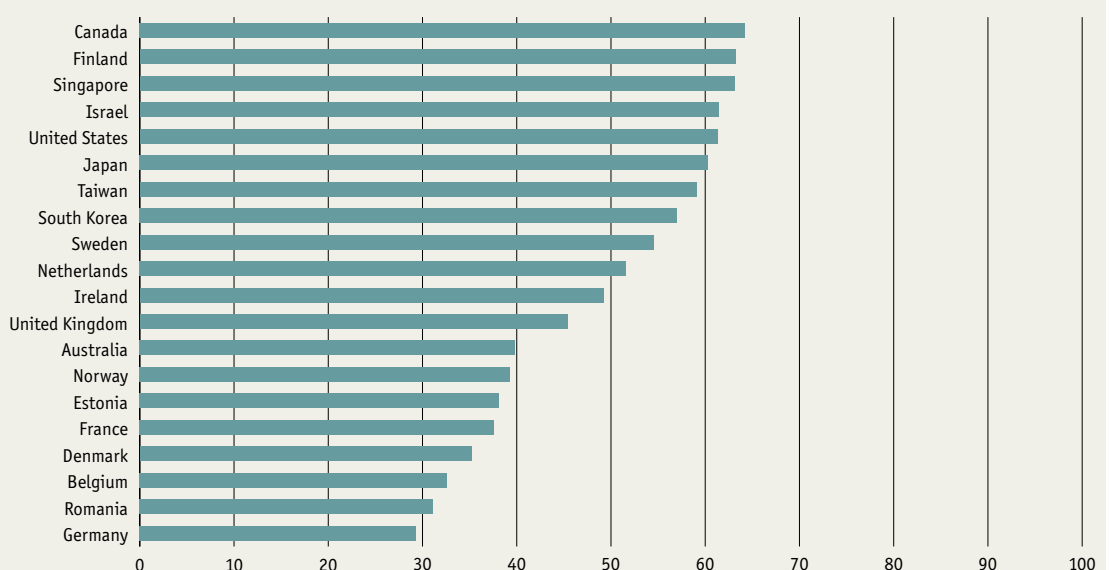
- Small IT firms will remain drivers of innovation, particularly in software, despite limited capital funding.
- Canada, Finland and Singapore top this category ranking, owing to their strong support for R&D and their IT firms' record of patenting innovations.
- Taiwanese, South Korean and Japanese firms remain the most prolific generators of IT patents in Asia.

The innovation environment

Naturally, there are fears that technology innovation could suffer in the downturn. Small companies, often deemed to be the source of new thinking, currently face serious difficulties in gaining access to capital. The best ones are at risk of being swallowed by acquisitive corporations seeking pioneering technologies in their portfolios (although in some cases this could sustain innovative activity which might otherwise stall). And as all companies trim costs, R&D investments are under threat.

Typically, however, it is pressure from start-ups that is forcing the larger firms to act. Mr Juster of Salesforce.com—which as a start-up itself pioneered the cloud computing software model—believes that start-ups and smaller companies will continue driving innovation in software during the global downturn. “Larger IT firms are trying to adopt some of the cloud practices to appeal to their customers, but they have difficulty with the cutting-edge innovation because it conflicts with their

R&D environment: Top 20 countries and scores



Countries are scored on a scale of 1- 100. See Appendix 3 for a full list of scores.
Source: Economist Intelligence Unit.



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traditional business model,” he says. If Mr Juster is right, it is imperative that governments cultivate an investment setting that allows smaller businesses to flourish.

Canada, Finland and Singapore, along with Israel and the US, top this category ranking owing to their strong support for R&D and their IT firms’ record of generating patents. But it is no accident that they all boast start-up-friendly environments, networks of venture capitalists and an entrepreneurial culture.

Companies also need a degree of flexibility to sustain their R&D investments, giving an opportunity to smaller and mid-sized firms. Israel-based Alvarion is investing a whopping 25% of its annual revenue—almost twice the proportion spent by larger rivals—on a nascent but promising wireless broadband technology called WiMax. It has taken a market lead in this subsector partly because other vendors have chosen to focus on their core competencies in the downturn. Mr Levy, the company’s general manager, says that even the biggest Israeli IT firms typically employ fewer than 500 people and have a nimbleness and adaptability that bigger rivals often lack. Their development is largely down to the Israeli government’s farsightedness in cultivating the country’s IT industry (see box, “The fertile crescent”, on the following page). “The government is proactive in providing grants and other incentives for research in technology,” confirms Mr Levy. “Business over the past two decades has proven that this works.”

Future of the low-cost model

Another factor that is forcing Alvarion to keep its R&D investment at high levels is competition from low-cost markets in Asia. As the industry becomes more global, new labour markets open up, wages rise in today’s outsourcing hotspots and Western companies cut expenses, the expectation is that Asian companies will start to lose their low-cost advantage. But this is likely to be a drawn-out process. Mr Lakshminarayanan of TCS reckons that the cost-competitiveness of India’s outsourcers—whose business models were originally based on India’s attractiveness as a low-cost labour market—is unlikely to disappear for many years.

Nevertheless, these companies are coming under pressure to compete in areas other than cost. Mr Lakshminarayanan argues that TCS, having come from a low-cost background, is now just as focused on

An abundance of patents

The generation of patents is an important—although certainly not the only—pointer to the innovative impulse of a country’s IT sector. For this reason, it is a heavily weighted indicator in the R&D category of the Economist Intelligence Unit’s index model. It has also been a difficult indicator to measure, because until recently most countries’ patent applications could not be attributed to any particular sector. This year, however, we have been able to make use of newly available data from the European Patent Office (EPO) on IT-specific (computer and office machinery) patent applications

filed with the EPO by firms in different countries. (Previously, we estimated IT-related patents using a measure of IT sector output as a share of GDP and applying that measure to total domestic patent applications.)

According to the EPO data, Canada is the most active generator of IT patent applications measured per 100 people. In last year’s index, Taiwan and South Korea were the two top-rated countries on patent activity, based on our estimates. Using the new EPO data, they now fall just behind Canada but remain the most prolific sources of IT patent applications in the Asia-Pacific region. The US, Japan and Germany file the largest number of IT patent applications in absolute terms.



The fertile crescent

Despite its diminutive size, Israel ranks fourth among 66 nations in the R&D category of the IT industry competitiveness index. Home to just 7.3m inhabitants, the Middle Eastern country has an impressive track record of innovation, supported by high levels of military and commercial research and a high-quality education system. Its ICT (information and communications technology) sector was responsible for 17% of business-sector GDP in 2007 and 12% of total GDP, compared with just 8% in 1990, while ICT services accounted for around 61% of the total output of the sector—a rising share—compared with 39% for manufacturing, according to the Central Bureau of Statistics. The sector is also a significant employer, accounting for 8.6% of the business-sector workforce, but around double that in terms of total pay.

Short-term recessionary setbacks could upset the story a little, but in the longer term the high-tech sector remains one of the country's strongest export prospects. New start-ups benefit from a well-

developed venture-capital market (although funding will be more difficult to secure than in past years), with over 100 local venture-capital firms dedicated to high-tech enterprises. Encouragingly, according to the Israel Venture Capital Research Centre (IVC), which monitors the sector, Israeli high-tech companies raised US\$2.08bn in venture capital in 2008 (around 31% from Israeli funds and the remainder from foreign sources), the highest level since 2000. The Economist Intelligence Unit also expects inflows of foreign direct investment (FDI) to support growth in the technology sector over the next two to three years, assuming the slowdown in global demand is not prolonged or deeper than currently expected.

Many foreign firms, as well as local companies, have a significant research and, to a lesser extent (given the relatively high cost of labour in the country), manufacturing presence in Israel. Software development is also an important component of the country's technology sector. Many of the technologies first developed in the military industry have since been adapted to civilian use, such as coding and networking technology used in Internet and wireless products.

“It’s all about the creation of intellectual capital as opposed to the production of it. So I think it will take much longer for some Asian countries to build a globally successful software business than it has taken to develop their hardware industries.”

Mark Bregman, chief technology officer, Symantec

finding the best talent in the most scaleable markets, while some of its Western outsourcing rivals are still trying to get the low-cost offshore model working.

Some observers, however, believe too few Asian companies are doing anything especially inventive. Mr Chowdhry of Global Equities Research believes that innovation in Asia is still too “process-based”. Mr Sun is even more critical of China’s industry. “Genuine innovation is quite rare, despite government efforts to encourage innovation in the software industry,” he says. One problem appears to be size, with many Chinese software companies too small and financially constrained to stand up to their Western rivals. “Hardware companies can do it more quickly, but software is something that has to be built up over the years, so I don’t think it’s a short-term challenge,” says Mr Sun.

Similar views are held by Mark Bregman, chief technology officer of Symantec. “The manufacturing cost advantage is negligible in the software business,” he says. “It’s all about the creation of intellectual capital as opposed to the production of it. So I think it will take much longer for some Asian countries to build a globally successful software business than it has taken to develop their hardware industries.”

Despite criticisms of China, however, Mr Heitmann believes that the next big global competitor to the world’s software giants is likely to come from there, partly because the government is encouraging Chinese students to be more business-minded and develop products that can be more easily scaled.

“This is nothing you can do by just copying—you need to be in a position to develop superior products by yourself,” he says. “We take our Chinese competitors very seriously.”



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Key points

- IP protection remains most effective in the developed world, but progress is being made in emerging economies.
- Brazil, Egypt and Vietnam, among other countries, have boosted their performance in enforcing IP rights.
- The rising incidence of cybercrime requires closer crossborder co-operation on legislation, investigations and information-sharing.

Law and order

The debate still rages over whether strict patent regimes foster IT competitiveness or hinder it. Tellingly, however, the countries with robust legislation and enforcement in this area are generally regarded as IT leaders and score highly in our index, with the US being the clearest example. By contrast, countries where protection of intellectual property (IP) has not been well enforced have not traditionally been seen as innovators, instead relying on their low-cost labour markets to remain competitive. India, for example, languishes in 51st position in the legal environment category and ranks as no more than an average performer in R&D; yet it falls within the top 15 countries of the index when it comes to human capital.

While IP regimes remain most effective in the developed world, progress is being made in emerging economies. “China and India are the two that are most problematic, but they are improving,” says Jonathan Ball, an IP lawyer and partner at Norton Rose, a UK-based law firm. China, for example, has

Legal environment: Top 20 countries and scores



Countries are scored on a scale of 1- 100. See Appendix 3 for a full list of scores.
Source: Economist Intelligence Unit.



Enforcing IP protection is also a problem in the developed world, and the high costs involved can be prohibitive for many small and medium-sized companies.

signed up to important international accords, such as the World Copyright Treaty and the WIPO (World Intellectual Property Organization) Performances and Phonograms Treaty (WPPT). “Given the amount of innovation that’s going on within those countries and how important the patenting system is becoming to their economies”, says Mr Ball, “the progression is to make patent enforcement in those territories easier to accomplish.”

Several emerging markets have improved their scores in this year’s index when it comes to enforcement of IP rights. Brazil, Mexico, Egypt, Ukraine and Vietnam, for example, have all received hard-earned praise for better enforcement efforts from the Office of the United States Trade Representative (USTR), in its latest report on foreign trade barriers, as has Taiwan.

Enforcing IP protection is also a problem in the developed world, and the high costs involved can be prohibitive for many small and medium-sized companies. Legislators in Germany have set up a fast-track patent litigation process aimed at lowering these costs, and Mr Ball thinks other countries could learn from that example. “Typically, a patent proceeding in an English court lasts 12–18 months, with live cross-examination of experts and a full two- to three-week trial,” he says. “In Germany, you have about half a day in court with no documentary disclosure exchange and limited reliance on expert written declarations. A case that would cost £1m in the UK might cost as little as €200,000 in Germany. It completely transforms the landscape in terms of who can sue.” Germany’s progress in this area has helped it to achieve ninth position in the legal environment category of our index.

Many EU countries, however, languish further down the league table. Perhaps the biggest frustration for multinational IT producers is the cost of dealing with numerous national authorities across the EU. The establishment of a patent that offers protection across the entire EU has been discussed, but Mr Ball reckons it is fraught with political difficulties and may still be a long way from being a reality. “What’s likely to happen first is the setting up of a unified patent litigation court in Europe for the bundle of European patents,” he says. “We could have something along those lines in the next few years, depending on whether the European Commission puts its weight behind it.” Practical considerations will include the issue of language and the location of any such court, but Mr Ball believes that such a step would provide a huge boost to Europe and the competitiveness of its IT industry.

Taking the initiative for online protection

As this report has made clear, the ability to use online channels to do business is increasingly central to the competitiveness of IT firms and sectors. Governments have been adopting legislation to govern and protect online activity for over a decade, but “e-commerce law” remains a relatively young sphere of legislative activity. Many countries, particularly in the developing world, have yet to introduce or update laws on data privacy, spam or cybercrime—all of which figure prominently in the legal environment category of our index. (The picture is brighter when it comes to electronic signature legislation, another legal environment indicator; the vast majority of countries in our index have laws in place governing this aspect on online business.)

Cybercrime has come to be a particularly vexing problem affecting the IT industry and economies more broadly. According to a study conducted by the Center for Education and Research in Information



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Assurance and Security (CERIAS, attached to Purdue University in the US) and published by McAfee, an IT security firm, businesses worldwide suffered IP theft of an estimated value of US\$4.6bn in 2008 due to cybercrime and spent about US\$600m in repairing damage from the resulting data breaches.³ Given this level of threat, which is cross-border in nature, strengthening national cybercrime legislation is enormously important for countries, as is signing on to international efforts to combat the menace.

The Council of Europe Cybercrime Convention remains the de facto global treaty on cybercrime. The treaty has now been signed by 22 countries, but—importantly—not Russia or China, where a number of recent attacks are believed to have originated. Russia, unsurprisingly, lingers in 59th place in the legal environment category of the index. “Increased international co-operation is clearly needed in the area of cybercrime,” says Mr Juster of Salesforce.com. “That could be in terms of investigations and law enforcement, monitoring the Internet and sharing information.”

³ McAfee, *Unsecured Economies: Protecting Vital Information*, 2009.



Conclusion: The virtue of a steady hand

While the recession has thrown into stark relief some of the problems facing the IT sector in countries around the world, many of the remedies remain the same as in a boom. Perhaps the most important tactic that governments can adopt in the immediate term is to avoid new trade restrictions or “buy local” requirements in the technology parts of their stimulus packages. Worst of all is support for ailing national champions, which impedes the development of the market and the emergence of newer, more innovative players.

At the same time, however, local companies need to be granted fair opportunities if they are ever to prosper. Countries where it is fairly easy to set up and run a business, where the venture-capital industry is an integral part of the business environment and where there is little stigma attached to failure (and there are few penalties for not succeeding) usually boast competitive IT industry environments. Equally important is the need for robust legislation that protects IP rights; in this context, continuing progress in countries such as China and India—where enforcement has historically been weak—is encouraging.

Without a good supply of local talent, countries are unlikely ever to develop competitive IT sectors. For all the IT graduates being churned out of Asian economies, there are still concerns that education systems in the region put too much focus on pure IT skills and not enough on IT in a business context. Top schools in the US and Europe do better in this area. On the other hand, the US and Europe each face long-term challenges in cultivating the science and technical engineering skills of its younger students.

Lastly, beyond current economic stimulus packages, governments can do more to bolster the infrastructure on which the IT industry of the future will depend. Several of our interviewees noted that IT is currently undergoing a sea change, as more applications move off individual sites and into the “cloud”. The efficiency gains that will result from this development could benefit entire economies, but countries—and national IT sectors—that lack the broadband infrastructure needed to access these services will be left behind.

Appendix 1: Index methodology and definitions

The purpose of the IT industry competitiveness index is to compare countries in different regions of the world on the extent to which they possess the conditions necessary to support a strong IT industry. To achieve this, the Economist Intelligence Unit maintains a benchmarking model which scores individual countries on the key attributes of a competitive IT sector.

There are six categories of indicator used in the index; these are set out below, along with their weights in the index, and that of each indicator in the category. The main data sources for each indicator are also provided, along with an indication of whether the score is based on quantitative data (for example, US\$ spend, number of students) or on a qualitative assessment made by Economist Intelligence Unit analysts.

Qualitative indicators are scored on a 1-5 basis. Quantitative indicators are normalised through the population set so that each country is measured from 0 to 1 by applying a formula ($Y_{ij} = [x_{ij} - \min_{ij}] / [\max_{ij} - \min_{ij}]$) to each data point. Each indicator is then converted into a score of 0-100 by applying the appropriate multiplier (20 for the qualitative indicators, 100 for the quantitative indicators). The "max" and "min" for each metric have been established based on the data sets available for 2008. In so doing, score changes year on year are directly comparable to increases or decreases in the value of the underlying data over time.

As the weights sum to 1, the composite score for each country is also based on an index range of 0 to 100 (with 100 representing the highest and best possible score).

As described earlier in this report, a number of improvements have been made to the index model in 2009. First, a new indicator—mobile phone penetration—has been added to the IT infrastructure category. We have also sourced newly available data from the European Patent Office (EPO) to score the IT patents indicator in the R&D environment category. (Previously, we estimated IT-related patents using a measure of IT sector output as a share of GDP and applied that measure to total domestic patent applications.) In deriving employment levels in the IT sector, we are now able to use hard data from the OECD for a large number of countries, and this has also enabled us to refine our estimates for non-OECD countries. (Previously, we estimated IT employment for all countries in the index.)

Lastly, we have adjusted the weights of several indicators. The category and indicator weights were formulated at the time of the index's creation by the Economist Intelligence Unit's modelling team using, as a guide, individual correlation co-efficients of each indicator against a measure of IT labour productivity. The weights are reviewed each year by the modelling team, and those for selected indicators have been adjusted in 2009, both to accommodate the new mobile-phone indicator and to reflect the team's evolving views on the relative importance of all the indicators. (The weight relationships of indicators suggested by the original correlations, however, have been maintained.)

Appendix 1:

Index methodology and definitions

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Indicator	Weight	Main data sources	Year	Type of score
Category 1: Overall business environment	10%			
Government policy towards foreign capital; cultural receptivity to foreign influence; risk of expropriation; investment protection	20%	Economist Intelligence Unit: Business Environment Rankings	2004–08	Qualitative: assigned by Economist Intelligence Unit analysts
Degree to which private property rights are guaranteed and protected	35%	Economist Intelligence Unit: Business Environment Rankings	2004–08	Qualitative: assigned by Economist Intelligence Unit analysts
Level of government regulation (mainly licensing procedures) on setting up new private businesses	25%	Economist Intelligence Unit: Business Environment Rankings	2004–08	Qualitative: assigned by Economist Intelligence Unit analysts
Freedom of existing businesses to compete	20%	Economist Intelligence Unit: Business Environment Rankings	2004–08	Qualitative: assigned by Economist Intelligence Unit analysts
Category 2: IT infrastructure	20%			
Market spending on hardware, software and IT services (US\$ per 100 people)	15%	IDC	2008	Quantitative
Desktop and laptop computers per 100 people	35%	Pyramid Research; ITU	2008	Quantitative
Broadband connections (xDSL, ISDN PRI, FWB, cable, FTTx) per 100 people	25%	Pyramid Research	2008	Quantitative
Secure Internet servers per 100,000 people	10%	Netcraft; World Bank	2008	Quantitative
Mobile-phone penetration per 100 people	15%	Pyramid Research	2008	Quantitative
Category 3: Human capital	20%			
Total number of students in higher education, as % of gross university-age population	25%	World Bank	2007	Quantitative
Enrolment in tertiary-level science programmes, as % of total tertiary-level enrolment	15%	UNESCO	2006	Quantitative
Employment in technology sector	20%	OECD; Economist Intelligence Unit estimates	2007	Quantitative
The education system's capacity to train technologists with business skills (project management, customer-facing application and web development, etc)	40%	Economist Intelligence Unit	2008	Qualitative: assigned by Economist Intelligence Unit analysts
Category 4: Legal environment	10%			
Comprehensiveness, transparency of IP legislation; adherence to treaties	35%	Economist Intelligence Unit: Business Environment Rankings; national sources	2004–08	Qualitative: assigned by Economist Intelligence Unit analysts
Enforcement of IP legislation	35%	Economist Intelligence Unit; USTR; national sources	2008	Qualitative: assigned by Economist Intelligence Unit analysts
Status of electronic signature legislation	10%	National sources	2008	Qualitative: assigned by Economist Intelligence Unit analysts
Status of national data privacy and anti-spam laws	10%	National sources	2008	Qualitative: assigned by Economist Intelligence Unit analysts
Status of national cybercrime laws	10%	National sources	2008	Qualitative: assigned by Economist Intelligence Unit analysts

Indicator	Weight	Main data sources	Year	Type of score
Category 5: R&D environment	25%			
Gross government expenditure on R&D (US\$ at purchasing power parity, PPP), per 100 people	15%	UNESCO; World Bank	2005-06	Quantitative
Gross private-sector expenditure on R&D (US\$ at PPP), per 100 people	15%	UNESCO; World Bank	2005-06	Quantitative
Number of new domestic patents registered by residents each year (per 100 people)	50%	European Patent Office; Economist Intelligence Unit estimates	2005	Quantitative
Receipts from royalty and licence fees (US\$) per 100 people	20%	IMF; World Bank	2006	Quantitative
Category 6: Support for IT industry development	15%			
Access to medium-term finance for investment from domestic and foreign sources	20%	Economist Intelligence Unit; Business Environment Rankings	2004-08	Qualitative: assigned by Economist Intelligence Unit analysts
Existence of a coherent national government strategy to achieve e-government objectives, aimed at improving both public service delivery and efficiency of back-office operations	30%	UN; European Commission; Economist Intelligence Unit analysts	2008	Qualitative: assigned by Economist Intelligence Unit analysts
Government spending on IT hardware, software and services (US\$ per head)	15%	Estimates, based on IDC	2008	Quantitative
Existence of an even-handed public policy stance on technology or sector development (absence of preferential government support for specific technologies or sector)	35%	Economist Intelligence Unit analysts	2008	Qualitative: assigned by Economist Intelligence Unit analysts

Appendix 2: Index scores by region

Rank	Country	Score
The Americas		
1	United States	78.9
2	Canada	71.3
3	Chile	46.1
4	Brazil	36.6
5	Argentina	36.5
6	Mexico	32.0
7	Colombia	28.4
8	Peru	26.0
9	Venezuela	24.4
10	Ecuador	22.7
Western Europe		
1	Finland	73.6
2	Sweden	71.5
3	Netherlands	70.7
4	United Kingdom	70.2
5	Denmark	68.6
6	Norway	67.1
7	Ireland	66.9
8	Switzerland	63.5
9	France	59.2
10	Belgium	59.2
11	Germany	58.1
12	Austria	57.0
13	Italy	48.5
14	Spain	47.4
15	Portugal	45.3
16	Greece	43.0
Eastern Europe		
1	Estonia	55.6
2	Czech Republic	47.0
3	Hungary	46.1
4	Slovenia	45.3

Rank	Country	Score
Eastern Europe		
5	Lithuania	43.3
6	Latvia	42.6
7	Slovakia	41.4
8	Poland	40.8
9	Romania	39.6
10	Croatia	38.3
11	Russia	36.8
12	Bulgaria	33.6
13	Ukraine	31.4
14	Kazakhstan	26.4
15	Azerbaijan	21.3
Middle East & Africa		
1	Israel	64.3
2	South Africa	35.3
3	Saudi Arabia	33.9
4	Turkey	33.8
5	Egypt	26.8
6	Algeria	19.8
7	Nigeria	18.8
8	Iran	17.1
Asia-Pacific		
1	Australia	68.7
2	Singapore	68.2
3	Japan	65.1
4	Taiwan	63.4
5	South Korea	62.7
6	New Zealand	58.8
7	Hong Kong	57.5
8	China	36.7
9	Malaysia	35.6
10	India	34.1
11	Thailand	31.8
12	Philippines	28.5
13	Vietnam	25.0
14	Sri Lanka	23.9
15	Indonesia	22.8
16	Bangladesh	21.1
17	Pakistan	20.0

Appendix 3: Index scores by category

	Overall index score	Business environment	IT infrastructure	Human capital	R&D environment	Legal environment	Support for IT industry development
Category weight		10%	20%	20%	25%	10%	15%
United States	78.9	97.3	81.3	75.6	61.3	92.0	88.6
Finland	73.6	98.2	79.2	53.3	63.2	85.0	86.5
Sweden	71.5	90.1	90.2	48.8	54.5	81.5	86.3
Canada	71.3	88.3	71.3	53.3	64.2	82.0	88.6
Netherlands	70.7	90.1	92.5	44.7	51.6	87.0	84.6
United Kingdom	70.2	93.2	81.4	58.8	45.4	85.0	86.9
Australia	68.7	92.3	81.0	57.2	39.8	90.5	85.3
Denmark	68.6	95.1	93.8	49.9	35.2	87.0	86.0
Singapore	68.2	91.0	66.8	44.4	63.1	81.5	86.0
Norway	67.1	86.5	84.7	48.7	39.3	85.0	89.5
Ireland	66.9	95.1	65.9	56.3	49.2	81.5	83.2
Japan	65.1	82.9	70.2	51.6	60.3	79.0	63.4
Israel	64.3	81.3	67.3	48.2	61.4	72.0	70.1
Switzerland	63.5	88.3	92.8	40.5	28.4	88.5	80.6
Taiwan	63.4	86.5	61.5	55.0	59.1	73.5	61.8
South Korea	62.7	79.7	63.2	58.9	57.0	67.0	62.0
France	59.2	82.4	65.8	45.1	37.6	83.5	73.7
Belgium	59.2	89.2	60.3	44.8	32.6	88.5	81.4
New Zealand	58.8	91.4	67.1	53.7	19.5	80.0	84.4
Germany	58.1	88.3	74.0	43.9	29.3	85.0	65.9
Hong Kong	57.5	97.3	71.3	40.6	21.3	80.0	80.5
Austria	57.0	87.4	68.4	41.6	27.1	85.0	73.2
Estonia	55.6	81.3	57.2	45.3	38.1	69.5	69.8
Italy	48.5	72.7	52.5	48.4	16.4	73.0	64.2
Spain	47.4	87.4	45.6	47.9	10.6	71.0	68.0
Czech Republic	47.0	75.4	52.1	42.7	21.4	67.5	56.1
Chile	46.1	93.2	26.2	42.0	19.9	69.0	75.5
Hungary	46.1	81.3	36.8	46.7	24.3	67.5	56.1
Slovenia	45.3	67.8	43.6	47.2	12.0	73.0	66.8
Portugal	45.3	85.6	47.7	42.9	7.5	71.0	63.9
Lithuania	43.3	73.7	40.4	44.4	15.6	67.5	55.5
Greece	43.0	72.7	31.3	49.1	16.4	67.5	58.6
Latvia	42.6	78.6	35.1	47.1	15.5	65.5	52.5

	Overall index score	Business environment	IT infrastructure	Human capital	R&D environment	Legal environment	Support for IT industry development
Category weight		10%	20%	20%	25%	10%	15%
Slovakia	41.4	75.5	36.2	37.4	17.3	69.5	52.5
Poland	40.8	74.5	39.9	43.1	6.6	66.5	56.1
Romania	39.6	67.6	30.4	31.8	31.1	56.0	46.7
Croatia	38.3	60.8	34.0	35.9	16.7	62.0	52.3
Russia	36.8	46.4	27.1	53.1	26.4	42.0	35.3
China	36.7	48.8	13.8	57.9	23.2	59.5	38.2
Brazil	36.6	73.6	21.6	31.5	17.6	49.5	61.6
Argentina	36.5	58.1	24.9	38.9	20.3	63.0	43.2
Malaysia	35.6	74.6	24.2	28.1	11.7	54.0	62.0
South Africa	35.3	74.9	17.8	31.8	13.2	63.5	55.0
India	34.1	59.0	1.9	49.5	22.0	48.0	51.0
Saudi Arabia	33.9	68.0	26.2	27.7	13.2	47.5	55.0
Turkey	33.8	75.9	20.7	34.4	3.5	61.0	54.4
Bulgaria	33.6	62.6	31.8	37.0	5.2	56.0	44.3
Mexico	32.0	70.5	16.8	32.9	2.5	58.0	57.6
Thailand	31.8	75.7	14.4	35.6	2.2	43.5	61.8
Ukraine	31.4	40.3	20.4	37.6	24.5	49.5	31.0
Philippines	28.5	67.8	8.3	34.5	2.0	50.5	51.1
Colombia	28.4	65.7	14.8	24.4	1.5	54.5	54.3
Egypt	26.8	61.7	6.8	31.5	4.7	45.5	48.0
Kazakhstan	26.4	49.1	11.7	27.1	14.9	42.0	38.5
Peru	26.0	56.7	11.6	22.1	6.9	48.5	47.2
Vietnam	25.0	48.9	13.0	21.7	5.3	47.0	47.6
Venezuela	24.4	50.2	17.6	30.9	2.2	40.5	33.8
Sri Lanka	23.9	61.7	5.0	18.4	2.1	53.5	48.0
Indonesia	22.8	49.1	5.0	27.5	2.0	47.0	41.0
Ecuador	22.7	56.3	11.5	21.0	1.5	46.5	37.2
Azerbaijan	21.3	41.2	7.7	16.1	10.4	40.0	38.5
Bangladesh	21.1	51.2	0.6	18.4	2.0	40.0	51.0
Pakistan	20.0	55.9	3.3	17.5	2.3	41.0	37.0
Algeria	19.8	46.2	8.3	18.1	4.5	35.0	35.0
Nigeria	18.8	38.1	2.9	18.8	0.4	33.0	48.0
Iran	17.1	28.8	10.7	21.7	6.0	31.0	21.0

While every effort has been taken to verify the accuracy of this information, neither The Economist Intelligence Unit Ltd. nor the sponsor of this report can accept any responsibility or liability for reliance by any person on this white paper or any of the information, opinions or conclusions set out in this white paper.

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