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The World's Top Innovators

Source: Soumitra Dutta, INSEAD, and Simon Caulkin, World Business
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Globalisation has pushed innovation to the top of the agenda, but which countries respond best to the new challenges?

The World Business/INSEAD Global Innovation Index 2007 in association with BT.

Which nations and regions respond best to the challenge of innovation? In recent years, innovation has pushed itself to the very top of policy-making and senior executive agendas. What has put it there can be summed up in one word: globalisation. Now INSEAD and World Business have developed the Global Innovation Index (GII) to measure the shock of the new.

When all economies are interdependent and interconnected, the "waves of creative destruction" described by economist Joseph Schumpeter show no respect for national boundaries, rolling with impunity over the whole planet. And technological change is accelerating - US futurologist Ray Kurzweil has noted that "in the first 20 years of the 20th century, we saw more advancement than in all of the 19th century. And we won't experience 100 years of progress in the 21st century - it will be more like 20,000 years of progress at the current rate."

Simply doing the same as before - only more intensively - is a losing strategy; there is nowhere left to hide. Instead of trying to wring diminishing returns from today's array of goods, services and processes, prosperity urgently demands that companies quickly shift to creating fresh value from new ones.

A recent report from the US' Council on Competitiveness declared: "Innovation will be the single most important factor in determining America's success in the 21st century. Where once we optimised our organisations for efficiency and quality, now we must optimise our entire society for innovation." In Europe, 2000's Lisbon Agenda challenged the EU to make itself "the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs, and greater social cohesion" by 2010.

The emerging economies are racing towards the same goal. Since the late 1990s, China has boosted its R&D spending by 50%. Now, led by president Hu Jintao, Beijing wants to raise it to 2.5% of GDP - $115 billion - annually. Even in Africa, governments are attempting to use technology as a springboard for innovation and development. Ethiopia, one of the poorest countries in the world, is committed to bringing a broadband connection within reach of all its 74 million population by 2007, and little more than a decade after the horrors of 1994, Rwanda is working to create a knowledge-intensive, technology-enabled business environment (see box).

Innovation is about much more than generating new ideas. Translating these ideas into value- adding products and services requires flexibility of attitude and willingness to adapt to, and welcome, unprecedented levels of change on the part of individuals, organisations and society as a whole. So who is doing it best? What are the conditions for doing so? Can we pin down the catch-all notion of innovation in ways that can be quantified and normalised to generate meaningful comparisons?

It was to answer questions like these that World Business commissoned INSEAD Business School to develop the GII. Our starting point is the belief that response-readiness is directly linked to a country's ability to adopt, and benefit from, leading-edge technologies, expanded human capacities, better organisational and operational capability, and improved institutional performance.

We have brought together for the first time a number of related and complementary indicators into a holistic framework for measuring innovation performance (see box). Using this framework, we can not only rank the world's best and worst-performing economies in terms of innovation, but also provide insights into countries' strengths and weaknesses in their innovation-related policies and practices.

The results are revealing - and in some cases surprising. For example, while the presence of the US at the top of the table is predictable, the great extent of the lead is less so. Typically, differences between consecutively ranked nations are marginal (remember, these are relative scores). However, the US leads the second most innovative nation (Germany) by almost a full point, putting it in a league of its own as far as global innovation is concerned. This is confirmed by the top ranking that the country garners in both 'input' and 'output' sections of the model. The US is unique in being consistently among the top eight performers on all the measures used in the GII.

Also less than obvious is Germany in second place. Indeed, with five countries in the top 10 - the UK, France, Switzerland and the Netherlands alongside Germany - and 11 in the top 20, old Europe puts in a collective performance that belies the conventional hand-wringing over supposed sclerosis. It also puts in a new light this year's critical Aho Report (named after its chairman, former Finnish prime minister Esko Aho) to the European Commission, which noted that Europe had fallen behind the US in key measures such as average growth rates of real GDP, labour productivity and total factor productivity (ie, management). Taken as a whole, the GII shows on the contrary that Europe's innovation performance is both impressive and an optimistic sign for the future.

Nevertheless, for those wanting to know where the future lies, the direction is clear: look east. While Japan comes in at a highly creditable fourth overall - a rebirth of the Asian powerhouse after the doldrums of the 1990s - followed by Singapore (7th), Hong Kong (10th) and South Korea (19th), perhaps even more significant is the appearance of India and China at 23rd and 29th respectively. With the burgeoning and technology-hungry middle classes of these two countries adding to existing strengths, Asia is set to redefine many aspects of innovation. Already South Korea is the most advanced broadband society in the world; China has more than 300 research centres, second only to the US, and this number is steadily increasing. Perhaps the biggest global challenge for international firms will be to find ways to tap into and leverage these emerging Asian drivers of global innovation.

Another sign of the shifting tectonic plates of the world economy is the appearance of the United Arab Emirates at 14th in the global list. The brightest star in the Middle East - four places above Israel - UAE has benefited from government leadership that sets it apart from its neighbours through policies explicitly designed and implemented to attract skilled workers and technology-intensive companies. The result, particularly in Dubai, has been growing clusters of innovative companies.

These are the headline findings from the rankings, but many other intriguing plots and sub-plots lurk in the details of the model. As shown, the eight innovation 'pillars' in the GII framework are grouped in two separate categories: 'inputs', factors that underpin innovative capacity such as institutions and policies, human capacity, infrastructure, technological sophistication, and business markets and capital; and 'outputs', the benefits that a nation derives from the inputs in terms of knowledge creation, competitiveness and wealth generation.

The rich quantitative and qualitative data generated under each pillar allow us to get under the surface of the raw rankings and begin to interpret how and why countries respond to the innovation dynamic (care is needed here: this is a first snapshot - definitive trends will become clearer as the data accumulates in subsequent years).

The US' top ranking on both input and output scores suggests why it is so far ahead of rivals: relative to

others, it has both a better environment for innovation and is more effective at exploiting it. Central to its leading position is the magnetism it continues to exert, building constantly on its human capital. Leading universities and research establishments attract and actively encourage the best and brightest minds from around the world, and generous funding opportunities help create a virtuous cycle in which the best minds seek the best mentors.

However, top-notch institutions, abundant funding and bright minds don't by themselves add up to a winning formula in a worldwide battle for talent - witness the unwillingness of some European countries to tap talent from emerging economies. It also takes a culture of diversity, optimism and meritocracy, in which individual background is much less important than the desire to succeed.

The US has other important input strengths. Take the two complementary pillars: technological sophistication and business markets and capital - with savvy investors and some of the most efficient markets and capital flows in the world, great ideas in the US have no trouble finding backing. US venture capital totals dwarf those anywhere else by orders of magnitude, creating a supportive environment for entrepreneurship and job creation. Meanwhile, US firms are adept at deploying technology and promising processes in operations - studies suggest that smart application of technology accounts for up to 80% of US productivity gains over the last decade. In turn, the demanding customer base is one reason why the US technology sector is so vibrant and innovative.

But the US also faces question marks, both political and economic, at home and abroad. With the emergence of India and China as economic powers in their own right, the shape of the global competitive landscape is changing. Until now, the US has managed to camouflage the shortcomings of its primary and secondary education by attracting overseas talent. Now it faces the need to produce more scientists and engineers from within, just as it must improve the quality of an ageing communication and transportation infrastructure.

More insidiously, the traditional US mood of openness to all-comers has changed since 9/11. Is the hostility that greeted the Dubai Ports World (ultimately unsuccessful) takeover of six US ports and the banning of (foreign) online poker companies evidence of a growing economic nationalism? If so, then it is a bad sign for an economy that has thrived on its acceptance of economic migration from whatever quarter.

Pillar performance also tells some significant stories about Europe. At the top level, the presence of Germany, the UK and France (ranked 2, 3 and 5 respectively) at the innovation top table is reassuring. But it is striking that, apart from the UK, European innovation performance is less balanced than in the US. Germany, France, Ireland, Spain and Italy form a group that does better on the output side than input. The countries do well in terms of knowledge and wealth creation with the capacities they have, but they would benefit from improving their innovation underpinnings in market-friendly institutions and policies. For instance, it takes an average of 24 days to start up a business in Germany, a substantial institutional burden, and the country also suffers from employment rigidity.

Self-imposed hurdles are particularly high on human capacity. Only France of the larger European countries scrapes into the top 10 on the human capacity measure, while the UK, Germany and Spain rank 16, 25 and 47 respectively. Although Europe provides high-quality basic education, it has failed to develop enough world-class universities, research institutions and business schools. The UK aside, no European country can boast universities that rank among the very best in the world. Similarly, economies such as Germany have not done enough to promote diversity and free up internal labour markets.

On the other hand, another group of countries, with the Nordics to the fore, currently do relatively better on inputs than outputs, suggesting that they have the potential to move up the overall table as the results of their investments feed through. Finland, for example, has put most of the ingredients of the future networked society in place by focusing on innovation, education and IT. Unlike the rest of Europe, it scores very highly on human capacity. Finland was the first country in the world to conceive of the idea of a national innovation system to feed into policy formulation. Leadership comes from the very top, with the Finnish prime minister chairing the science and technology council, which also has seven other ministers

among its members. Finland's investment in R&D, at 3.4% of GDP, is one of the highest in the world.

A less expected trendsetter is Estonia, 31st in the overall ranking. Since independence in 1991, it has been engaged in an ambitious attempt to drive innovation by bringing the country into the digital age. Estonia has one of the most modern telecommunications networks in Europe, low connectivity costs and high rates of computer literacy, which have led to an explosion of innovative service applications, notably in banking, education, health, transport and public administration.

We have already noted the attempts by Ethiopia and Rwanda to take hold of their destiny through a similar digital roadmap. Other governments are also investing heavily in human, institutional and technology inputs as a way of hauling themselves up the economic value chain. One of the earliest and most ambitious movers was Singapore (7th in the overall table), which has been engaged in a concerted effort to leverage the power of human capital and technology for innovation and growth for two decades. Led by a government that paved the way for recruiting worldwide talent by creating high-quality educational institutions and which has since formulated successive versions of national technology and innovation plans, Singapore has succeeded in combining a unique multicultural society with a pervasive service-oriented culture.

Another example is Israel, which has a sparkling economic story to tell in human capacity and technological sophistication inputs. Strong ties to Silicon Valley and US academic and research institutions are important advantages, and successive governments have invested heavily in education - reinforced by large-scale immigration - to build human capital. As part of a close collaboration with business, successive governments have also developed effective investment incentives, fostered the highest spending on R&D of any industrialised nation (4.6%) and overseen incubator and venture capital programmes to convert research into new businesses.

Israel has the highest number of engineers per capita in the world (twice that of the US and Japan), a supportive culture of risk-taking and a powerful drive to succeed. Against that, it is dragged down by a poor competitiveness rating (41st), partly as a result of the horrible political situation.

There is no shortage of entrepreneurial spirit or tradition in the Middle East. It seems a long shot today, but it is intriguing to wonder whether, in time, given some breaks, the innovative economies of the region might be able to do what politics hasn't and tow the countries towards positive economic, rather than destructive battlefield, competition.

We believe that over time the index will prove to be an effective framework for evaluating the innovative capacity and performance, and making meaningful comparisons between nations and regions across the globe. The most important stories, however, are not static positions on a list, but dynamic ones, about learning and improving, and how advantage shifts over time. More than a simple ranking measure, the GII therefore is the jumping-off point for studying some of the most important questions facing the world economy today.

World development officials, for example, will closely follow IT and innovation-based initiatives to judge whether they provide a more effective path to the elusive goals of development and poverty elimination than traditional methods. Government ministers will want to know how 'planned', officially-sponsored, input-driven innovation stacks up against the market-generated US variety; whether the innovation-powered flywheel that has driven the US economy for the past 30 years can be replicated.

Alternatively, now that some of the engineering and entrepreneurial diaspora of China and India is returning home, it may be that the US will have to devote time and energy to rebuilding the input pillars that the market is incapable of repairing, such as education. Another intriguing question is how multinational companies will cope with this shifting competitive map. They already outsource many back-office processes and R&D to India and other low-cost countries. Now they have made it clear that they may have no choice but to go where the talent is, wherever that may be.

As these larger issues suggest, the pressures of global innovation are already changing the face of the

planet. Year by year, the index will chart how they do it.

Rank	Country	Score*
1	US	5.80
2	Germany	4.89
3	UK	4.81
4	Japan	4.48
5	France	4.32
6	Switzerland	4.16
7	Singapore	4.10
8	Canada	4.06
9	Netherlands	3.99
10	Hong Kong	3.97
11	Denmark	3.95
12	Sweden	3.90
13	Finland	3.85
14	UAE	3.81
15	Belgium	3.77
16	Luxembourg	3.72
17	Australia	3.71
18	Israel	3.68
19	South Korea	3.67
20	Iceland	3.66
21	Ireland	3.66
22	Austria	3.64
23	India	3.57
24	Italy	3.48
25	Norway	3.48
26	Malaysia	3.47
27	Spain	3.38
28	New Zealand	3.35
29	China	3.21
30	Kuwait	3.14
31	Estonia	3.12
32	Czech Republic	3.10
33	Chile	3.03
34	Thailand	3.01
35	Slovak Republic	2.97
36	Hungary	2.88
37	Mexico	2.88
38	South Africa	2.87
39	Portugal	2.86
40	Brazil	2.84
41	Tunisia	2.84
42	Malta	2.82
43	Slovenia	2.81
44	Barbados	2.79
45	Turkey	2.75
46	Cyprus	2.73
47	Lithuania	2.71
48	Indonesia	2.71
49	Greece	2.69
50	Latvia	2.67
51	Costa Rica	2.66
52	Jamaica	2.63

53 Jordan 2.61
54 Russian Federation 2.60
55 Croatia 2.59
56 Poland 2.53
57 Colombia 2.50
58 El Salvador 2.49
59 Panama 2.47
60 Mauritius 2.46
61 Kazakhstan 2.45
62 Romania 2.44
63 Argentina 2.41
64 Azerbaijan 2.40
65 Vietnam 2.38
66 Philippines 2.38
67 Uruguay 2.37
68 Guatemala 2.36
69 Peru 2.35
70 Dominican Republic 2.29
71 Sri Lanka 2.27
72 Nigeria 2.27
73 Pakistan 2.24
74 Egypt 2.24
75 Ukraine 2.24
76 Morocco 2.23
77 Venezuela 2.22
78 Kenya 2.22
79 Namibia 2.21
80 Tanzania 2.14
81 Bulgaria 2.12
82 Moldova 2.11
83 Algeria 2.11
84 Burkina Faso 2.10
85 Mongolia 2.08
86 Armenia 2.07
87 Macedonia 2.06
88 Uganda 2.05
89 Bosnia & Herzegovina 2.05
90 Ecuador 2.03
91 Honduras 2.02
92 Nicaragua 2.01
93 Georgia 2.00
94 Tajikistan 1.95
95 Cambodia 1.94
96 Cameroon 1.92
97 Guyana 1.84
98 Bangladesh 1.82
99 Nepal 1.79
100 Albania 1.78
101 Kyrgyzstan 1.76
102 Bolivia 1.72
103 Mozambique 1.72
104 Ethiopia 1.71
105 Lesotho 1.68
106 Paraguay 1.66

107 Angola 1.53