

# The Global Innovation Index 2011

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## *Executive Summary*

### ***The Global Innovation Index 2011 is a collaborative effort***

*The Global Innovation Index 2011* ranks 125 countries/economies across the world in terms of their innovation capabilities and results. The Report highlights those countries that achieve more innovation outputs surmounting weaknesses from the input side – the efficient innovators – and those that lag behind in fulfilling their innovation potential. Innovation performances are analyzed in reference to the income and regional groups.

The GII is a collaborative effort of five Knowledge Partners, all international leaders in the area of innovation, led by INSEAD, and including Alcatel-Lucent, Booz & Company, the Confederation of Indian Industry and the World Intellectual Property Organization (WIPO), a specialized agency of the United Nations. An Advisory Board of nine international experts from IOs, NGOs and academia was constituted to contribute to the project at the research and dissemination stages. In addition, the ranking, which is based on a transparent and easily replicable computation methodology, was submitted to a statistical audit by the Joint Research Centre (JRC) of the European Commission. The JRC has researched extensively on composite indicators and has developed, jointly with the OECD, the *Handbook on constructing composite indicators* (2008), with the state-of-the art in this area.

### **A broad definition of innovation**

A key challenge is to find metrics that capture innovation as it happens today in the world, particularly in emerging markets. The definition of innovation has broadened, and with it the challenge for data collection. Innovations are no longer restricted to R&D laboratories and to published scientific papers; these days, knowledge production is centred mostly around the firm where research is increasingly context-driven, problem- focused, application-oriented, and interdisciplinary. New or significantly improved product, processes and methods in the provision of services; in business and organizational models; in low-tech industries; through creative imitation and technological catch-up; at the public level or at the level of society, all constitute innovations.

### **The GII model**

The GII is calculated as the simple average of two sub-indices, while the Innovation Efficiency Index is the ratio of the two. The Innovation Input Sub-Index gauges elements of the national economy that enable innovative activities, grouped in five pillars: (1) Institutions, (2) Human capital and research, (3) Infrastructure, (4) Market sophistication, and (5) Business sophistication. The Innovation Output Sub-Index captures actual evidence of innovation outputs, divided in two pillars: (6) Scientific outputs and (7) Creative outputs. These pillars are divided into 20 sub-pillars, including a total of 80 indicators.

## Audit by the Joint Research Centre of the European Commission

The computation methodology adopted for the Report, which has the advantages of being transparent and replicable, is extremely sensitive to modelling choices and missing data points. To ensure the credibility of the whole exercise, results were submitted to a statistical audit by the Joint Research Centre of the European Commission.

The Audit assessed the robustness of the GII rankings to other modelling techniques, and involved the imputation of missing data, computation of geometric averages instead of arithmetic averages (the former are less compensatory), random weights, and principle components analysis, among others. The Audit confirmed that, for the top 40 and the bottom 14 countries, median ranks after 4,000 runs of Monte Carlo simulations differed from the GII ranks by less than five positions.

## Results by index and by income group

### Global Innovation Index

The overall GII scores provide a composite picture of the state of each country's innovation performance. The Report stresses leaders by index, by income group and by region.

The top 10 countries in the GII 2011 edition are dominated by Europe, with six countries, and includes two Asian economies and two North American countries: Switzerland, Sweden, Singapore, Hong Kong (SAR, China), Finland, Denmark, the United States of America (US), Canada, the Netherlands, and the United Kingdom (UK). Leaders in their respective regions are Switzerland (1st), Singapore (3rd), the US (7th), Israel (14th), Chile (38th), Mauritius (53rd), and India (62nd).

**Switzerland** comes in at top place in the overall GII 2011 rankings (up from position 4th last year) on the basis of its strong position in both the Input and Output Sub-Indices (3rd and 2<sup>nd</sup>, respectively). Although the country does not top any individual pillar, it places within the top 5 in three Input pillars (Institutions, Market and Business sophistication) and both Output pillars (Scientific outputs and Creative outputs).

The runner-up, **Sweden**, is the only country in the top 10 on all four indices. A knowledge-based economy, this outstanding performance is driven by 1st place on Scientific outputs.

**Singapore** ranked 3<sup>rd</sup> on the GII, shows its strongest performance in the Input Sub-Index, coming in at 1st place on the basis of top 10 positions on all 5 pillars. However, Singapore's Innovation Efficiency Index ranking is low (37th among high-income countries, 94th in the general rankings); this shows up in its relative weak performance in the Output Sub-Index, where it is ranked 17th overall

### Leaders by income group – GII

By income group, from high- to low-income countries, the leaders are Switzerland (1st), Malaysia (31st), China (29th), and Ghana (70th). China, at position 29, is the only developing country to be among the top 30; Malaysia, Chile, Moldova, and Lithuania make it to the top 40. Among high-income countries,

three countries lag behind: Greece reached the median score (63rd), followed by Trinidad and Tobago (72nd) and Brunei Darussalam (75th).

**Malaysia** tops the overall ranking within the upper-middle- income group at 31st position overall, placing 27th on the Input Sub-Index (1st within its income group) and 35th on the Output one. From the same region, at position 29, **China** tops the GII rankings among lower-middle-income countries, and is the only developing country in the top 30. China is 1st within its income group on all three main Indices (GII, Input, and Output). Among low-income countries, **Ghana** prevails with an overall rank of 70. Ghana's relative strengths lie in its Institutions, Human capital and research, Scientific outputs, and Business sophistication.

### The Innovation Output Sub-Index

The Innovation Output Sub-Index variables provide information on elements that are the result of innovation within an economy.

The top 10 countries in the Innovation Output Sub-Index are Sweden, Switzerland, the Netherlands, Germany, the US, Finland, Denmark, Israel, the UK, and Canada. The best-ranked economies within each region are Sweden (1st), the US (5th), Israel (8th), the Republic of Korea (11th), Brazil (32nd), India (44th), and Nigeria (62nd).

The **Netherlands** comes in 3rd on the Output Sub-Index, a performance driven by marks within the top 10 in international Patent Cooperation Treaty applications by residents, scientific and technical journal articles, total computer software spending, royalty and license fees' receipts, daily newspapers' circulation, and creative services exports. This excellent result allows it to be ranked 9th in the overall GII, despite its 16th place on the Input side.

**Germany** shows an excellent performance on the Output Sub-Index (4th), which does not compensate for its relative weaknesses on the Input side (21st). For the second consecutive year, Germany is not among the top 10 on the GII (12th). While its biggest strengths are in resident patent applications both at the national patent office and at the Patent Cooperation Treaty, its score is due to a good balance, as it is well positioned in practically all indicators included in pillars 6 and 7.

The **United States of America** (US) comes in at position 7 in the GII 2011, moving up from 11th position last year. The US is the only large country (in both size and population) in the top 10, driven by its strengths on the output side, benefiting from a high level of Innovation Efficiency (9th among high-income countries). The strongest pillars for the US include those of Market sophistication (4th) and Scientific outputs (5th). However, its performance across most of the other pillars is uniformly high.

### Top performers by income group – Output

By income group, the top-ranked countries in the Innovation Output Sub-Index are Sweden (1st), Brazil (32nd), China (14th), and Bangladesh (69th). In position 14, China again is the only non-high-income country in the top 30. Moldova, Brazil, Jordan, Malaysia, Costa Rica, Serbia, and Argentina all achieve rankings among the top 40. High-income countries with weak performances on the Output dimension

are Saudi Arabia (66th), Greece (72nd), Oman (78th), Trinidad and Tobago (87th), Bahrain (92nd), and Brunei Darussalam (94th), all of them in the lower half of the rankings.

**Brazil** achieves a strong 32nd position on the Output Sub- Index, topping the Output rankings among middle-income countries. With a weak 68th position on the Input side bringing it down, it still achieves 47th place on the overall GII. **Bangladesh**, a low-income country with a GDP per capita of 1,416 in purchasing power parity (PPP) dollars, tops the Output rankings among low-income countries, reaching position 69.

### The Innovation Input Sub-Index

The Innovation Input Sub-Index variables provide information on indicators that measure elements that must be in place to foster innovation in an economy.

The top 10 economies on the Innovation Input Sub-Index are Singapore, Hong Kong (SAR, China), Switzerland, Ireland, Sweden, Finland, Denmark, Canada, Luxembourg, and the UK. Regional leaders are Singapore (1st), Switzerland (3rd), Canada (8th), Israel (20th), Chile (36th), South Africa (40th), and India (87th).

**Hong Kong (SAR, China)** is ranked 4th overall and is the runner- up after another Asian economy, Singapore (discussed above), on the Input Sub-Index. Hong Kong (SAR, China) has an interesting profile, as it has positions within the top 5 in all pillars except the two that are traditionally linked to innovation: Human capital and research (30th) and Scientific outputs (24th). These two relatively low rankings mean that it reaches only 27th place on Efficiency among high-income countries (66th overall).

The result for **Ireland** is driven by its excellent marks in Institutions and Market and Business sophistication. Although Ireland presents a good environment and potential for innovation, it lags behind on the Output Sub-Index where it ranks 22nd.

**Finland** comes next, placing 6th on Input, 6th on Output, 5th on the GII, and 35th on Efficiency. Finland is ranked among the top 10 on five pillars: Institutions, Human capital and research, Infrastructure, Business sophistication, and Scientific outputs; the country's relative weaknesses are on the Market sophistication and Creative outputs pillars.

### Top performers by income group - Input

By income group, in descending order of income, the best performers present no surprises. With the exception of Singapore (1st), they are the same countries leading in the overall GII rankings by income group: Malaysia (27th), China (43rd), and Ghana (65th). Among developing countries, Malaysia is the only country in the top 30, followed by Chile, Lithuania, and South Africa in the top 40. Brunei Darussalam, ranked 70th, is the only high-income country in the lower half of the rankings.

### The Innovation Efficiency Index

When the Input and Output Sub-Indices are plotted against each other, the data seem to confirm that efforts made on enabling environments are rewarded with increased innovation outputs. The

Innovation Efficiency Index, calculated as the ratio of the Output over the Input Sub-Indices further explored this relationship.

The top 10 countries in the Innovation Efficiency Index are Côte d'Ivoire, Nigeria, China, Pakistan, Moldova, Sweden, Brazil, Argentina, India, and Bangladesh. This list includes some of the most densely inhabited countries in the world: China, India, Brazil, Bangladesh, and Nigeria are all among the 10 most populous countries in this year's sample, and place 1st on Efficiency in their regions (except for Bangladesh, which comes after India in South Asia).

Three BRIC countries (Brazil, India, and China) are in this select list, with the fourth, the Russian Federation, coming in only at 52nd place. By region, the best performers are Côte d'Ivoire (1st), China (3rd), Pakistan (4th), Moldova (5th), Brazil (7th), Jordan (16th), and the US (26th). By income group, in descending order of income, leaders are Sweden (6th), Brazil (7th), Côte d'Ivoire (1st), and Bangladesh (10th).

### **Top performers by income group - Efficiency**

Among high-income economies, the Europe and Central Asia region dominates the top 5, while Middle Eastern and North African countries present mixed results: Qatar and Israel are ranked 6th and 7th, respectively, and Oman and Bahrain are at the bottom. Apart from the Republic of Korea, ranked 8th, East Asian and Pacific countries have rather weak performances (New Zealand comes next at position 15). Twenty-four out of 44 high-income countries have lower rankings on Outputs than on Inputs.

Among upper-middle-income countries, some show a capacity to achieve more innovation outputs from less favourable conditions: Brazil, Argentina, Serbia, and Costa Rica make it to the top 40 on the Output Sub-Index, surmounting lower positions on the Input side. While other countries with excellent Input scores lag behind— Malaysia (position 27 on Input, and 35 on Output), Chile (36 and 57), Lithuania (39 and 59), and South Africa (40 and 83)—all four countries in the top 40 on the Input Sub-Index have lower (worse) ranks on Output. In this income group, 17 countries out of 30 have lower rankings on Output than on Input.

The same analysis among lower- middle-income countries leads to encouraging results. Six of the top 10 countries in the Efficiency Index come from this income group: Côte d'Ivoire, Nigeria, China, Pakistan, and Moldova take the first five spots, and India comes in 9th. China, Moldova, and Jordan are among the top 40 on the Output Sub-Index (at positions 14, 29, and 33, respectively). Within this income group, only 7 out of 33 countries have lower Output rankings than Input rankings, with the major differences found in Swaziland (which shows a drop of 32 positions from Input to Output scores), Mongolia (a difference of 29 positions), and Morocco (16 positions).

Among low-income countries, Bangladesh takes the lead at positions 114 and 69 on the Input and Output Sub-Indices, respectively. Ten out of 18 countries within this income group have Output scores lower than their Input scores, all of them Sub-Saharan African countries except for Cambodia (–5 positions). The bigger negative differences are found in Kenya (–45), Rwanda (–29), Zambia (–26), Niger (–22), Malawi (–14), and Ghana (–11).

## Regional rankings

Regions are discussed following the sum of average scores, in descendent order. Regional trends are further discussed in the concluding remarks.

### North America

Only two North American countries are represented. The US, in 7th position, is discussed among the leaders of the Output Sub-Index. Canada is in a commendable 8th position in the GII, 10th in Output and 8th in Input. It places among the top 10 on the Institutions, Infrastructure, Market and Business sophistication, and Creative outputs pillars. Canada also has lower, but still performing, positions on the sectors traditionally linked to innovation—Human capital and research (19th) and Scientific outputs (21st).

### Europe and Central Asia

A total of 44 economies from Europe and Central Asia are represented in this year's GII report, 19 of which are within the top 30 and only one—Tajikistan—among the bottom 25. The top positions, not surprisingly, correspond to high-income countries (down to regional position 24). Among high-income countries, Poland (43rd), Croatia (44th), and Greece (63rd) lag behind.

The five **Nordic countries** Sweden (2nd), Finland (5th), Denmark (6th), Iceland (11th), and Norway (18th) have very strong performances globally as well as regionally. Within the European Union (EU), among the **15 original EU countries** (EU15), the Netherlands and the UK are in the top 10, followed by Germany (12th), Ireland (13th), Luxembourg (17th), Austria (19th), and France (22nd). The rest of the EU15 countries—Belgium (24th) and the four Mediterranean countries, Spain (32nd), Portugal (33rd), Italy (35th), and Greece (63rd)—have lost key positions to some of the 12 countries that recently acceded to the EU (the EU12 group).

The **EU12 group** is led by high-income countries Estonia (23rd), Hungary (25th), the Czech Republic (27th), Cyprus (28th), and Slovenia (30th); in the same high-income group, Latvia (36th), the Slovak Republic (37th), and Poland (43rd) have relatively low scores. Upper-middle-income countries are all in the second quintile: Lithuania (40th), Bulgaria (42nd), and Romania (50th).

Among **non-EU countries** in the region, lower-middle-income Moldova (39th) leads, ahead of high-income Croatia (44th) and upper middle-income countries Serbia (55th), Russian Federation (56th), Turkey (65th), and Macedonia (67th) in the third quintile; and Bosnia and Herzegovina (76th), Albania (80th), Kazakhstan (84th), and Azerbaijan (88th) in the fourth quintile. The remaining lower middle-income countries show relatively good performances as well, and all are ranked in the third quintile: Ukraine (60th), Armenia (69th), and Georgia (73rd).

### East Asia and the Pacific

Fifteen economies are represented from East Asia and the Pacific, seven of which are within the top 30 and only one of which—Cambodia—is in the bottom 25. In addition, the top ranked countries among upper- and lower-middle income countries—Malaysia and China, respectively—come from this region. This region is almost tied with Europe and Central Asia in its innovation performance, even though in

terms of economic development it is much closer to the Middle East and North Africa (in this year's sample of countries).

The first two economies are in the global top 10: Singapore (3rd) and Hong Kong (SAR, China, 4th). Five more are in the top 30: New Zealand (15th), the Republic of Korea (16th), Japan (20th), and Australia (21st), all high-income countries. Among the regional high-income countries, only Brunei Darussalam lags behind at position 75.

The **Republic of Korea** tops the regional rankings on the Output Sub-Index, where it places 11th worldwide. Like the Netherlands, Germany, and the US, the Republic of Korea is among the most efficient innovators among high-income countries. **Malaysia**, the only upper-middle-income country in the region, tops the income group globally on both the GII and the Input Sub-Index (it is overtaken by Brazil on the Output Sub-Index). Further details about Malaysia can be found in the discussion of the country under the GII section.

Among the lower-middle-income group are some of the world's most efficient global innovators: China (1st on all three main indices within its income group, and in the general rankings it is 29th on the GII and 14th on Output), Thailand (48th and 46th), and Viet Nam (51st and 42nd). Mongolia (68th) the Philippines (91st), and Indonesia (99th) lag behind.

### The Middle East & North Africa

The GII includes 16 countries from the Middle East and North Africa, of which only two—Israel (14th) and Qatar (26th)—are ranked among the top 30; both high-income countries. The other five high-income economies in the region have rather disappointing positions: United Arab Emirates is at 34th place, Bahrain is at 46th, Kuwait at 52nd, Saudi Arabia at 54th, and Oman at 57th.

**Israel** tops the regional rankings on all three main indices, and is ranked 4th on Efficiency at the regional level. Israel's strength comes from pillar 6, Scientific outputs (where it ranks 4th), with good showings in knowledge creation and knowledge diffusion (2nd and 8th). Three upper-middle-income countries come from this region. Lebanon (regional 6th, overall 49th) and Iran (regional 13th and overall 95th) present weaknesses in both Input and Output indicators, and neither country is among the top 40 overall, while Algeria scores lowest among the countries with sufficient data to be included in the sample.

Jordan, an exception, ranks 4th in the region and 41st overall. The other lower-middle-income countries—Tunisia (regional 10th, overall 66th), Egypt (11th and 87th), and Morocco (12th and 94th)—are all in the lower half of the GII rankings, with Syrian Arab Republic (14th and 115th) and Yemen (15th and 123rd) among the bottom 25.

The position of **Jordan**, at 41st overall, is notable because it is more than 25 positions ahead of its closest competitor in the same region and income group, Tunisia. Although Jordan is only 8th in the region on Input, it is 3rd on Output. Jordan's leverage comes from Creative outputs, with a strong dynamism at the level of residents' trademark registrations at the national level (where it reached 1st place) and a relatively high level of creative goods exports.

This region does not have low-income countries represented in the GII sample.

## Latin America & Caribbean

Twenty countries from Latin America and the Caribbean are included in this year's GII. None of them reaches the top 30 on any of the three main indices (GII, Input, and Output), and three are ranked among the bottom 25: Venezuela, Nicaragua, and Bolivia. Trinidad and Tobago, the only high-income country in the region in the sample, is ranked a disappointing 72nd on the GII, 58th on the Input Sub-Index, and 87th on the Output Sub-Index.

Three upper-middle-income countries hold top positions within their income group: Chile (38th overall and 2nd in its income group after Malaysia), Costa Rica (45th and 5th), and Brazil (47th and 6th). Argentina (58th), Uruguay (64th), and Colombia (71st) are in the third quintile; Panama (77th), Mexico (81st), Peru (83rd), and Jamaica (92nd) in the fourth; and Venezuela (102nd) is down among the bottom 25. Costa Rica is the only country in the region to be among the regional top 3 on the GII and the Input and Output Sub-Indices (ranked 45th, 53rd, and 37th, respectively).

**Chile**, the second country in terms of GDP per capita after Argentina (with a per capita GDP of PPP \$14,331) at 38th place is the only country in the region to have reached a position within the top 40. Chile's strengths are in its Input Sub-Index (36th), with a commendable 18th position on the Institutions pillar. On the Output side, its strengths are in FDI net outflows (12th at 4.88% of GDP), and resident trademark registrations at the national office (6th).

Among lower-middle-income countries in this region, Guyana (61st) and Paraguay (74th) are in the third quintile; Guatemala (86th), El Salvador (90th), Ecuador (93rd), and Honduras (98th) are in the fourth; and Nicaragua (110th) and Bolivia (112nd) are among the bottom 25.

## South Asia

The four countries from South Asia in the sample show mixed results. India, ranked 62 overall, tops the regional rankings; it is followed by Sri Lanka (82), Bangladesh (97), and Pakistan (105). These four countries, however, have their strengths on the Output side. In effect, although they rank between 87th (India) and 123rd (Pakistan) on the Input Sub-Index, they rank between 44th (India) and 69th (Bangladesh) on the Output Sub-Index, with Efficiency Index rankings ranging between 4th (Pakistan) and 21st (Sri Lanka).

After China, **India** is the second most densely populated country, with 1.2 billion inhabitants; it is also eleventh in GDP, with US\$1,310 billion. A lower-middle-income country, it comes second after Sri Lanka in GDP per capita in PPP dollars in the region. India is ranked 62nd on the GII, 1st in its region, and 8th in its income group—after China, Moldova, Jordan, Thailand, Viet Nam, Ukraine, and Guyana. India comes in at 44th on the Output Sub-Index, within the top 30 on labour productivity growth (21st with 4.5%) and computer and communications services exports (4th globally, with 70.0% of total commercial service exports). India's position, however, is dragged down by its poor performance on the Input side (ranked 87th): India is in the last quintile on sub-pillars business environment, elementary education, tertiary education, and knowledge workers.

## Sub-Saharan Africa

A total of 24 countries from Sub-Saharan Africa are included in the rankings, none of which made it to the top 30, and 17 of which are ranked within the bottom 25. In this year's edition, not a single country from this region is classified as high-income. Regional leaders on the GII and the Output, Input, and Efficiency measures are Mauritius, Nigeria, South Africa, and Côte d'Ivoire. While only Mauritius and Nigeria achieve positions within the top 70 on the Output Sub-Index, it is noteworthy that six countries achieve this threshold on the Input Sub-Index: South Africa (40th), Mauritius (46th), Namibia (49th), Botswana (62nd), Ghana (65th), and Kenya (69th).

Among upper-middle-income countries, Mauritius (53rd overall) achieves the top regional spot on the GII, while South Africa (59th overall) is the runner-up, followed far behind by Namibia (regional 4th and overall 78th) and Botswana (5th and 79th).

With a population of 1.2 million and a GDP per capita of 12,838 in PPP dollars, **Mauritius** is the second least populous country in the region (after Swaziland) and the second wealthiest (after Botswana), so its top regional position is not entirely surprising. This island in the Indian Ocean is the only country in the region with rankings in the upper half of all three main indices.

**South Africa** tops the regional Input Sub-Index (40th globally). The Input score is driven essentially by an 8th position (in the global ranking) on market sophistication, the result of positions within the top 10 on the strength of legal rights for credit (7th), depth of credit information (1st), and domestic credit to private sector (9th, with 145.1%). Ranked 83rd on the Output Sub-Index, South Africa achieves placement among the top 40 in only two areas: resident patent applications through the Patent Cooperation Treaty and computer software spending (8th globally, with 0.9% of GDP).

Lower-middle-income countries all have poor performances. These are Nigeria (7th regionally and 96th overall), Senegal (8th and 100th), Swaziland (9th and 101st), Cameroon (10th and 103rd), Côte d'Ivoire (18th and 117th), and Sudan (24th and 124th).

Although **Nigeria's** position on the GII is rather low (96th), this country obtained the top regional position on the Output Sub-Index, where it is ranked 62nd, and has the second-best Efficiency Index score globally. Low-income countries Ghana (70th) and Kenya (89th) get relatively high scores—both within the regional top 10—reaching 1st and 3rd place, respectively, in the overall low-income group. Of the remaining countries in this income group and region, Tanzania, Uganda, and Mali fare relatively better on the Output Sub-Index (their ranks are in the fourth quintile); while the scores of Rwanda, Zambia, and Malawi are driven by somewhat better scores on the Input Sub-Index (ranking in the fourth quintile). Of the rest, Madagascar, Côte d'Ivoire, Benin, Zimbabwe, Burkina Faso, Ethiopia, and Niger are in the last quintile (the bottom 25) in all three main indices (GII, Input, and Output).

## Analytical chapters

It cannot be claimed, however, that the GII model captures all dimensions of innovation across continents. Analytical chapters included in this year's Report illustrate the richness of innovation, which is difficult to define, much less to encapsulate in a particular metric.

In a changing world where emerging economies are rapidly developing and increasing their relevance to the world at large, Latin America must lead in innovation in order to become, and remain, competitive. Latin American businesses offer many examples of successful innovations. Business leaders and public policy makers must focus on multiplying those examples and ensure that innovation at the micro level is scaled up into more productive economies at the macro level.

**Chapter 2, 'Innovation in Latin America: Recent Insights'** by Lourdes Casanova, Jeff Dayton-Johnson, Nils Olaya Fonstad, and Anna Pietikäinen is based on the Innovalatino report, a collaborative undertaking of INSEAD and the OECD Development Centre, funded by Fundación Telefónica ([www.innovalatino.org](http://www.innovalatino.org)). The chapter draws on recent results from an exclusive survey of over 1,500 manufacturing firms from eight countries (Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru, and Uruguay) and 50 mini case studies, or 'vignettes', developed for various innovation leaders within their own sectors, and the authors' analysis of innovation policies in the region. Drawing on these data, the authors show that in Latin America, innovation means more than catching-up or even leapfrogging by imitating innovative firms from more developed economies. In several revealing cases, Latin American businesses are redefining global business by developing new business models.

On the policy-making side, several countries have institutionalized good practices in ways that promise to create a better environment for innovation. The authors highlight five important lessons from Latin America for other countries seeking to strengthen their innovation capacity amidst similar conditions. The chapter concludes with some general strategic orientations that should be useful to many national governments in the region, and a description of how, in operational terms, greater attention needs to be paid to the particularities of the national, and in many cases sub-national, levels.

The West has been spearheading the scientific and technological revolution in the world for the past century and a half. New and improved products, processes, and markets have remained the backbone of growth. Traditionally, developing economies of the world, such as India, have been slow to catch up with the rapid pace of technological advancement. Pressing issues such as developing ways to alleviate poverty and provide health care and infrastructure for a billion people have consumed much of India's time and resources. But, since the early 1990s, this situation has been changing slowly.

The information technology revolution and increased mobile connectivity have brought people closer and armed them with the power of knowledge about the world. An informed populace is also a more discerning populace — more demanding and assertive. **Chapter 3, 'Innovation in India: Affordable Innovations'** by Manisha G. Singh, Anuraj Gambhir, and Jibak Dasgupta, present evidence of the emergence of a new consumer base. Big multinational corporations are shifting their focus towards the rapidly expanding middle-income group of consumers by coming up with frugal innovations. The authors provide several specific examples of innovations — a car, a refrigerator, and two health care solutions —

that conform to the requirements of middle-income Indian consumers and have become successful, even beyond India itself.

The trend of ‘reverse innovation’ has set in, where an innovation is developed and/or adopted first in the developing world and then deployed in mature markets. This resurgence of innovation in developing markets is an indication of the economic and technological shift on a global level where India could play a major role in the new world order. The authors conclude by considering what India must do to move forward and embrace sustainable innovation — by focusing on practical applications that can be expanded globally, by cultivating innovation as a habit, and by providing ways to foster collaboration among stakeholders, among others.

People around the world are moving to cities in greater and greater numbers. As the population in cities increases — and ages — it gets increasingly difficult for municipal governments to deliver basic services, let alone ensure a high quality of life for city residents. Even more troubling, the increasing concentration of humanity in urban environments is bringing about profound, largely damaging changes to our biosphere and climate. Current rates of growth and resource consumption are fundamentally unsustainable.

**Chapter 4, ‘Making Cities Smart and Sustainable’** by Kurt Steinert, Revital Marom, Philippe Gichard, Gaspar Veiga, and Louis Witters shows how the smart city offers a vision of how to resolve some of these vexing challenges by applying ICT to mitigate the impacts of rapid urbanization and the associated follow-on effects. It also presents an opportunity to rethink how we manage growth, both regionally and locally. As importantly, by making cities smarter, we have the opportunity to reduce energy consumption in a truly dramatic way.

The authors point out that the success of smart city initiatives will require innovation in a variety of dimensions, most notably the creative application of technology coupled with novel public policy initiatives. This demands levels of collaboration among private and public stakeholders far deeper than any seen to date. It also requires the extensive and creative application of innovation in terms of technology, public policy, finance, and governance. The consequence of successful collaboration can include a smart cities broadband network, which will be both more efficient and more equitable.

The authors provide specific examples of smart ICT innovations that can reduce carbon emissions and increase energy-efficient options in a number of areas, and conclude by pointing out that we have a tremendous opportunity before us, if we act smartly. Urbanization cannot continue on its current path. The smart city vision offers an opportunity to chart a more sustainable course.

**Chapter 5, ‘The Global Footprint of Innovation’** by Barry Jaruzelski, Chadi Moujaes, and Hatem Samma, takes a look at the increasingly connected world and considers what corporations must do to understand their global clients and to remain capable of making significant contributions in innovation. With increasing globalization, corporate innovation strategies are also becoming global. Multinational corporations are spending a significant — and growing — share of their research and development (R&D) money outside the countries in which they are headquartered.

However, simply globalizing one's innovation footprint will not guarantee success. Companies must be careful about where to deploy their R&D resources, keeping in mind where the best talent can be found and which markets they want to enter. And there are operational challenges in performing R&D overseas: Too much fragmentation of effort, for instance, can undermine the large investments in infrastructure and technology that a global footprint requires, and can cost companies greatly in lost collaboration. To be able to stay in the global competition, the job of innovation leaders — and of corporate strategists — is not only to choose which capabilities to pursue. Just as often it is to decide which ones do not matter as much in achieving superior performance. Companies that focus on the capabilities they believe are critical differentiating factors in their efforts to conceive of, develop, and sell their product in their particular markets—on what they need to do better than competitors—can gain coherence necessary to outperform. And that, of course, is what innovation — and corporate strategy — is really all about.

The world is entering a phase that demands novel approaches to solving problems of environment, economy, and access to essential goods (food, water) and services (health care). To address the problems, the focus is increasingly on innovation in measurement and policy circles. This is a welcome development. Creativity, however, is an essential ingredient in the process of finding solutions and providing new products and services. The interaction between creativity and innovation is especially important at the sub-national level — in particular, in regions and cities, where clusters of talent, creativity, and technology concentrate to produce economic and social value.

While this is undeniable, **Chapter 6, 'Accounting for Creativity in Innovation: What We Should Be Measuring and Related Difficulties'** by Sacha Wunsh-Vincent, shows that the role of creativity in the process of innovation and how to foster it is still largely ignored. Little attention has been paid to the need to measure culture and creativity or to construct relevant indices that can shed light on this complex relationship.

The chapter reviews existing available data on culture and creativity and existing creativity indices. It assesses their strengths and weaknesses from a measurement perspective, by stressing the absence of a clear statistical framework and related classifications, the lack or scarcity of official measures for culture or creativity, and by conducting an in-depth review of the most prominent creativity indices in the field. It concludes by calling for additional measurement efforts, which will help us better apprehend the way culture, creativity, and innovation interact with one another, and what associated policy conclusions could emerge.