Executive Summary

The Global Innovation Index (GII) 2014 covers 143 economies around the world and uses 81 indicators across a range of themes. Thus, the GII 2014 presents us with a rich dataset to analyse for global innovation trends. The theme for this year's GII is the 'Human Factor in Innovation'. The importance of both individual and collective efforts of creators and scientists in the innovation process has been well documented in the literature. The results of the GII provide additional evidence of this significance.

This report presents chapters that discuss different aspects of the index and the theme, followed by appendices that provide the data from individual data tables for each indicator, a profile for each of the countries/economies covered this year, detailed information about the sources and definitions of each indicator, and technical notes about the composition of the index.

Below we provide a summary of the chapters.

Chapter 1, 'The Global Innovation Index 2014: Nurturing New Sources of Growth by Developing the Human Factor in Innovation' written by Soumitra Dutta, Rafael Escalona Reynoso, and Alexandra L. Bernard from Cornell University; Bruno Lanvin from INSEAD; and Sacha Wunsch-Vincent from WIPO, introduces the theme of the human factor and discusses the results of this year's rankings. The material below summarizes the key findings from the chapter:

- The need to gather more knowledge of, and a better understanding of, the role that the human factor—along with technology and capital—plays in innovation is critical. Statistically and analytically capturing this contribution and nurturing it through adequate education, training, and motivation in schools, universities, businesses, civil society, and the government itself is a challenge.
- As of 2013, a fall in the growth of public R&D support coupled with the continued hesitancy of company R&D expenditures seems to be leading to slower overall growth of total R&D expenditures worldwide; this is the case especially in high-income countries. If indeed future-oriented policies aimed at stimulating innovation and new sources of growth are not widely pursued, hopes for sustained global growth could be dashed.
- The top 10 economies in the GII 2014 edition are Switzerland, the United Kingdom (UK), Sweden, Finland, the Netherlands, the United States of America (USA), Singapore, Denmark, Luxembourg, and Hong Kong (China). Nine of these economies were already in the GII top 10 in 2013; Ireland, which was 10th in 2013, dropped to 11th this year, and Luxembourg climbed up into the top 10 from 12th position in 2013.
- The GII 2014 confirms the continued existence of global innovation divides even within income groups. All top 25 economies are in the high-income group. China and Malaysia are the only upper-middle income countries getting closer to these ranks.
- Sub-Saharan Africa is the region that sees the most significant improvement in GII rankings in 2014. Thirty-three countries make up the region in the GII. Of these 33, 17 climb in the rankings this year, three remain in the same position, two new countries are added, and the remaining 11 exhibit a drop in rank.
- Regional trends in the GII 2014 show some interesting new aspects. The BRICS economies show signs of divergence, with China improving at a significantly faster pace than its BRICS counterparts and India slipping back. If China continues to improve at this pace, it would not be a surprise to see it move from its current 29th position to within the top 25 within a few years. The divergence of India from the rest of the BRICS economies is the result of the challenges it faces in integrating its efforts along the

different dimensions of innovation to sustain a high level of innovation success.

In **Chapter 2,** 'The Human Factor in Innovation', Martin Schaaper from the UNESCO Institute for Statistics analyses and discusses major global trends related to the presence of skilled labour in countries. In particular, he makes the following points:

- The more developed the region, the higher the percentage of the population that have completed tertiary education.
- More and more students are enrolling in tertiary education.
- On tertiary enrolment, again the richer regions are far ahead of the poorer regions, in particular Sub-Saharan Africa.
- The regions with the highest numbers of people with tertiary education and with the highest enrolment ratios in higher education are also those with the most researchers as a proportion of the total population.
- Economies that are catching up are more dependent on technology transfer than they are on original R&D.
- R&D is generally unprofitable in countries with low levels of human capital.
- A very relevant factor for innovation is the movement of highly skilled people, whether they are students or experienced professionals.
- Economies at the lowest levels of development may be trapped in a vicious circle: low economic development does not offer a context that provides enough incentives for young people to pursue higher education, and without a skilled population, economies will not grow.
- More information is needed about the demand for skills by employers and the supply of these skills by highly educated people.

The chapter also provides some region-specific statistics:

- The two regions with the highest numbers of people with a tertiary education and with the highest enrolment ratios in higher education are also the two regions with the most researchers as a proportion of the total population: North America and Western Europe and Central and Eastern Europe
- The highest growth rates in enrolment in tertiary education are in Asia, with the exception of Central Asia, where the gross enrolment ratio even decreased after 2007.
- This region is dominated by China, which has not only been extensively expanding its higher education system, but has enlarged its research system even more.
- The magnitude of the global emigration rate of highly skilled persons from Africa is striking: it is estimated at 10.6% (9.7% for migration to OECD countries), compared with other regions of origin and the world average of 5.4% (4.3% to OECD countries).
- The leading countries of origin among immigrants with a highest degree in science and engineering are China and India.

Chapter 3, 'Educating Innovators and Entrepreneurs' written by Richard Scott and Stéphan Vincent-Lancrin from the OECD Directorate for Education and Skills, discusses the necessity of education and skills for successful innovation. The chapter offers some region-specific observations:

- Countries range from those with comparatively low test scores and high interest in science (e.g., Mexico) to those with comparatively high scores and low interest (e.g., Finland), but a few do have relatively high scores and high interest (e.g., Japan).
- Even in many Asian economies, where education systems have typically been associated with traditional learning models and a narrow focus on STEM subjects, there are signs of new efforts to emphasize creativity and critical thinking in national curricula.

The chapter concludes:

- Improving skills is one of the most important ways to raise innovation, productivity, and economic growth, and to improve social welfare and equality.
- Education systems that narrowly focus on test-based academic performance and numbers of students enrolled in science and technology subjects are not necessarily those that will produce young people with the creativity, critical thinking, and communication skills that innovative societies require.
- Analysis of PISA scores highlight a negative correlation between national-level student test scores in science and interest in science, but certain teaching

activities are able to improve scientific knowledge without undermining the development of other skills.

- Graduates of tertiary arts programmes are among the most likely to contribute to product or service innovation.
- Evidence of the effectiveness of school-level entrepreneurship education programmes is mixed; more work is needed to determine the successful elements of this type of intervention.
- Although many countries are addressing the kinds of skills needed for innovation in their curricula, school assessment methods may provide a barrier to their development.

Chapter 4, 'Higher Education in India: Growth with Challenges' written by Naushad Forbes from the Confederation of Indian Industry and Forbes Marshall Ltd, describes the characteristics of the higher education system in India. In particular, he makes the following points:

- Higher education has grown very rapidly in India over the last 30 years.
- Most of the growth has occurred primarily in professional fields, especially engineering and management.
- The growth has occurred in teaching rather than in research, with public research in India highly concentrated in autonomous research institutes instead of universities.
- Most of the growth has been in private institutes rather than public ones.
- Because the most dramatic growth has been in professional education such as engineering and management, the humanities and social sciences have been neglected.
- India now faces the following challenges: the need to ensure quality, to build graduate education and research universities, to provide equity of access, and to build excellent liberal arts universities.
- More useful measures have taken the form of various schemes to entice Indians with PhDs who are working overseas to come back home.

Chapter 5, 'Innovative Activities and Skills' written by Leonid Gokhberg and Valentina Poliakova from the National Research University – Higher School of Economics, Russian Federation, posits that successful innovation requires the population to obtain a higher level of education, to be more creative, and to boost their ability to perceive essential achievements in science, technology, and innovation (STI) and implement those in daily practices.

Further, the chapter explains:

- Groups of the population that do not participate in the implementation and consumption of innovation because of the specificities of their jobs and/or their quality of life are at risk of being left behind by social exclusion and subsequent backwardness.
- Discrepancies between perception and impact assessments correlate with an economy's position on a transition curve towards a post-industrial, innovation-based economic model.
- The larger the shares of innovating companies and allied employment, the more operational the population's function as producers of innovation.
- Children have become a strong factor affecting technology diffusion, a fact explained by its deepening penetration into the contemporary lifestyle.
- As shown by the surveys, four types of survey respondents can be distinguished according to their attitude towards technological novelties: 'admirers' (9%), those who respond 'positively' (65%), those who respond 'indifferently' (16%), and those who respond 'negatively' (5%).
- The innovative potential of an individual is not an instinctive feature, and essential skills for innovation can be learned.
- National education systems are motivated to transform formal curricula and teaching techniques and to promote life-long learning aimed at supporting the innovative patterns of a population's behaviour and attitudes.
- There is a need to modernize education systems so that they will ensure the development of knowledge, innovative skills, and personal qualities (such as entrepreneurship, tolerance, self-confidence, leadership, creativity, activeness, and risk propensity) from early childhood.
- Popularizing innovation and allied novel practices aimed at upgrading competences and developing an innovation-friendly environment are also important components of boosting competitiveness.

Chapter 6, 'United Arab Emirates: Fostering a Unique Innovation Ecosystem for a Knowledge Based Economy' written by Ahmad Bin Byat and Osman Sultan from du, discusses the United Arab Emirates' (UAE's) path towards transformation into an innovative economy. The authors find three pillars of innovation in the UAE: human capital, financial capital, and technological capital. Innovation occurs at the intersection of these three, and policy in the country is aimed at enhancing these pillars.

The chapter explains:

- Telecommunications infrastructure and services are the backbone of a knowledge-based economy. Aside from this, the telecommunications sector in the UAE also has a key role to play in promoting innovation and in supporting the country's evolution towards a knowledge-based economy.
- To further the aim of the UAE's Vision 2021, the UAE has invested significantly in education and capability development, setting the foundation for long-term competitiveness.
- The UAE is actively working to promote innovation through policies and targeted initiatives aimed at developing human capital while addressing the requirements of financial and technological capital.
- The UAE currently boasts one of the most advanced education systems in the Middle East and North Africa (MENA) region, thanks to continuous investments across all education levels.
- The UAE's budget allocation to education represents more than 20% of its total government budget, higher than the benchmark average of 13%.
- The key imperative going forward is to develop the deep technical skills that are required for disruptive innovations, as opposed to generalist skills.
- Attracting foreign talent is an important aspect of establishing and maintaining an innovative environment.
- Immigrants constituted 96% of the total UAE workforce in 2013 and 99.5% of the nation's 4 million private-sector employees. The UAE government is also encouraging the local population, which has been more drawn towards working in the public sector, to join the private sector to develop their skill sets.
- One other essential element of a successful ecosystem of innovation is the encouraging and fostering of young entrepreneurs. One of the most effective ways to do this is through mentoring, and the UAE is emerging as one of the best places for entrepreneurship to thrive.
- The UAE government's R&D efforts are targeted at specific sectors to solve its market needs and key socioeconomic challenges.
- Fostering an innovation ecosystem requires ensuring adequate early-stage funding, venture capital, and growth equity.
- Cultural barriers to innovation—such as fear of failure and an aversion to taking risks—can present serious difficulties, yet are starting to diminish in the UAE.

In **Chapter 7,** 'Retaining Top Innovators: An Essential Element of Competitiveness for Developing Countries', David R. Walwyn from the Department of Engineering and Technology Management, University of Pretoria, and Sibusiso Sibisi from the Council for Scientific and Industrial Research, South Africa, posit that the mobility of talented people is critical to a system's capacity for learning, adapting, and innovating. They explain:

- A small number of researchers and innovators account for a major proportion of the overall output.
- The most productive innovators are also the most mobile.
- The retention of this cohort of innovators is a neglected but important policy objective for developing countries.
- Talented innovators tend to cluster in the same places, even at the same institutions.
- Leading researchers and entrepreneurs are more likely to pursue their careers in the USA or the UK.
- The migration of innovators from developing to developed countries is also evident in statistics on inventions, where it has been shown that inventors in developed countries such as the USA and Switzerland are more likely to be immigrants than natives.
- The capacity of some countries to attract and support higher levels of extraordinary talent, allowing it to develop and flourish, is a consequence of many factors that include funding, facilities, international migration, strong local networks and clustering, and the 'Sanger factor'.

- Developing countries should pursue priorities other than the provision of research and innovation infrastructure necessary to retain the elite cohort.

Chapter 8, 'The Moroccan Diaspora and its Contribution to the Development of Innovation in Morocco' co-written by a collection of authors from the Moroccan Industrial and Commercial Property Office (OMPIC), R&D Maroc, several Moroccan ministries, the National Centre for Scientific and Technical Research, and the Hassan II Foundation for Moroccans Living Abroad, describes the Moroccans living abroad and the mobilization of the country's highly educated workforce. The chapter considers following points in detail:

- The mobilization of a highly educated workforce is an important part of international migration strategies.
- The lack of qualified human resources in a globalized and competitive market place that requires knowledge and know-how generates new reasons for Morocco's population to be mobile.
- The feminization of the group of Moroccans Living Abroad (MLAs) has continued, with the migration of single women reflecting the evolving emancipation of women in Moroccan society.
- Highly skilled Moroccans (those with a tertiary or graduate degree) make up 15% of the Moroccan Diaspora.
- The share of persons with a university diploma is twice as high among the MLAs as it is among the domestic Moroccan population.
- Identifying the skilled members of the Diaspora who contribute actively to innovation is extremely difficult because the data are often simply not available.
- Of the patent applications published under the PCT (Patent Cooperation Treaty), 876 have been filed by MLA inventors at international locations in the 16 years from 1995 through 2011.
- An analysis of patents issued under the PCT enables the identification of patents by inventors who belong to the Moroccan Diaspora, which can serve as a proxy for determining MLA inventors.
- MLAs constitute a scientific potential of creativity and innovation for Morocco through mobilization programmes of the Moroccan Diaspora skills.
- There has been a steady return of migrants of working age in the last decade. Of those who returned to Morocco, 81% are under 54 years old, and more than two-thirds have their own businesses.
- To get those working abroad to return home, the following is recommended:
  - » considering specific return campaigns centred around major technology projects,
  - » mobilizing these human resources in a targeted manner and earmarking these projects, and
  - » creating the conditions and environment favorable to the contribution of professionals who are now abroad to further the development of innovation in Morocco.